Dealing with energy security in Europe

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Dealing With Energy Security in Europe

A comparison of gas market policies in the European Union and the United States

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Voor Jan en Ieke

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PREFACE AND ACKNOWLEDGEMENTS

The idea to write a dissertation first arose seven years ago during an internship at the Scientific Council for Government Policy (WRR) in The Hague. Drafting my small contribution to an advice for the Dutch government about the legitimacy of European Union policy in the Netherlands, made me realize how much fun research can be. When inquiring about the pros and cons of writing a dissertation my supervisor, Monika Sie Dhian Ho, was clear. Surely I had an inspiring and wonderful time in The Hague, but it had been peanuts. Writing a dissertation was something else. Many years of hard labor with occasional ups and many downs. Was I sure? Regularly I was reminded of these words and surely, Monika, you were right. But despite that fact I am happy and somewhat proud that I was stubborn. And I am confident you don't mind either.

In The Hague I started working as a corporate counsel at Brabers, a partnership that provides counsel, renders advice and serves the interests of companies that operate in regulated markets. After expressing my research ambitions my employer, Robert Stuyt, suggested a combination of professional work in his energy practice and becoming part-time researcher at the University of Groningen. It resulted in five wonderful and instructive years, with wonderful colleagues, great experiences and lots of fun. Robert, Leo, Frederik, René, Maritza, Cocky, Erik, Kitty, Béten, Rob, Tom, Rogier, Björn, Philip, Siebe, and all the others, thank you.

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Tim Boersma
Hardenberg, May 2013

SUMMARY

Energy security has been back on the political agenda since Ukraine seized supplies of natural gas to the European Union (EU) in 2006. Though it was the first substantial supply disruption in several decades, the incident sparked lengthy and sometimes heated debates about the availability of supplies, reliability of suppliers and diversification of supply routes. Since 2010 the European Commission (EC) has openly acknowledged that the aforementioned supply disruptions could have been dealt with if the EU internal energy system were functioning properly. This analysis shows that there are abundant gas supplies available to the EU gas system but that they cannot always flow freely, which weakens the system's capacity to respond to disruptions. Despite the fact that attracting sufficient investment in gas infrastructure and streamlining national regulations have been on the agenda for a substantial period of time, the EU still has challenges to overcome in both these fields.

This study examines whether existing decision-making structures in the EU are adequate to address these issues. It does so by carrying out an ex-ante institutional analysis following neofunctionalist and new institutional economic thinking. Neofunctionalist theory seems applicable to energy policy development in the EU for a number of reasons, e.g. because it acknowledges the notion that newly designed institutions in Europe pursue their own interests and appear to actively steer the integration process. New institutional economists attribute value to the context in which economic activity takes place, i.e. the interplay between supply and demand and how that determines prices. This idea is relevant when analyzing the EU internal gas system's functioning, because some of the described inefficiencies are found in institutions, e.g. the lack of implementation of existing legislation, or the inadequate streamlining of national regulatory regimes. Finally a multilevel governance framework has been applied to dissect decision-making structures in two of the case studies. Though its merits as a theory of European integration have been widely debated, the framework is helpful in this context, because it distinguishes between geographical scales, and also allows for a distinction between public and private actors. Also, multilevel governance has been applied to the case of the United States, which is used as a benchmark in all three case studies, because it is widely viewed as being the only well-functioning gas system in the world. The data used in this study come from policy documents, reports, legislation and regulations, and academic

contributions, as well as interviews that were carried out during extensive fieldwork on both sides of the Atlantic Ocean.

The case study in chapter 4 shows that the existing mechanisms in Europe to attract investment in gas infrastructure are insufficient. As a result, EC estimates suggest that approximately € 70 billion of investments in gas infrastructure are needed in the period up to 2020. These investments are not going to take place under business as usual conditions. In terms of possible incentives the US gas system provides valuable insights, e.g. clearer mandates for institutions involved, a regulatory focus on security of supply instead of merely efficiency and the allowance of more generous and stable rates of return. However, it is worth bearing in mind that the EU gas system is in transition and therefore lacks the decades-long institutional history of the US. Also, it seems fair to conclude that on the other side of the Atlantic Ocean non-economic pipelines are simply not being built, due to a market-based approach that the EU is less familiar with. The analysis also suggests that the position of independent regulatory authorities deserves further empirical attention, as in Europe currently having independent national regulatory authorities means having 27 potentially different regulatory regimes. In a liberalized EU gas system a more coordinated approach seems desirable, and the establishment of the Agency for the Coordination of Energy Regulators (ACER) and in the future expanding its mandate is one of the options to orchestrate this.

In chapter 5 shale gas extraction on both sides of the Atlantic Ocean is examined. The analysis reveals several fundamental differences between the US and the EU. First and foremost, geologic realities may be different, and therefore prohibit substantial extraction of natural gas from shale rock layers in Europe. Second, though energy related policies in Europe are predominantly the domain of the Member States, this is not always the case when environmental policy is concerned. Since several environmental concerns, most notably air pollution, water related concerns, induced seismicity and disclosure of chemical constituents, have been explicitly linked to hydraulic fracturing, environmental policy may well halt European industrial activity before it even takes off. In the US, even a decade after shale gas development was embraced in several states to date it has proved to be difficult to effectively regulate these environmental concerns. Third, the fundamentally different market structure in the US has allowed for in particular smaller natural gas companies to attract venture capital and spur the large scale extraction of shale gas long before the larger companies became interested. In Europe, such a development is highly unlikely. Finally, the US is unique in that resources found under the earth's soil are property of the land owner. Hence – with roughly 80% of current shale gas extraction taking place on private lands – land owners have played a crucial role in the extraction of resources. In Europe, shale gas extraction is basically still in an embryonic phase, and the case of Poland is used to demonstrate that several substantial hurdles, most notably the lack of physical infrastructure, market development, and implementation of relevant legislation, currently prevent large scale shale gas extraction, even if geologic conditions would be favorable. Also, this case study demonstrates how the elusive concept of energy security can distract the attention from the aforementioned hurdles, or even be counterproductive. As such, this confirms the conclusion in chapter 2 that the securitization of energy resources is often problematic and counterproductive, and that the available evidence suggests that the issue is often not securitized but merely politicized. In addition, the academic debate about energy security turns out to be rather one-sided, and focuses mainly on the availability of resources and reliability of suppliers, whereas other elements of the energy system are equally important to the functioning of the whole system. Finally the case study on shale gas reveals European integration dynamics: on the one hand natural gas extraction is an exclusive Member State affair, yet on the other hand environmental policy – which is explicitly linked to this form of natural gas extraction – is often dealt with by European institutions.

Chapter 6 examines several components of the European natural gas system, i.e. available and planned infrastructure, implementation of legislation, market trade and long-term contracts, and the role of liquefied natural gas (LNG). In terms of available gas transmission infrastructure, substantial investments are required to complete the internal gas system. The analysis also demonstrates the asynchronous development of parts of the EU gas system, with Northwestern Europe being reasonably well integrated, whereas the larger part of Europe is not. A substantial amount of Member States has not implemented existing legislation. As of late 2012, infringement procedures are pending against fourteen different Member States, and that may not be all. The results further suggest that market trade is still hindered in the larger part of Europe, due to a variety of reasons. Currently, it is also unclear what exactly the role of long-term oil-indexed contracts in European gas markets is going to be. Oversupply of natural gas since mid-2008 has further increased the difference between spot-market prices and those in long-term contracts, sometimes resulting in renegotiation of contracts by suppliers and producers. It appears from the analysis that the EC intends to let long-term contracts and spot-market trade coexist, but that the conditions for long-term contracts in Europe may increasingly shift away from oil-indexation to for instance hub-based indexation. Finally, the chapter discusses the role of LNG in Europe. Though liquefied natural gas could arguably contribute to security of supply in Europe, it remains to be seen to what extent it in fact will. The results suggest that the center of gravity for LNG demand has further shifted towards Asia in recent years. Also, without a functioning internal gas system, it is questionable whether all Member States can equally benefit from potential LNG supplies.

Overall the results suggest that existing decision-making structures in the EU are not always adequate to deal with the urgent problems at hand. Currently European institutions are trying to address this issue but their efforts have been hampered by Member States and independent national regulatory authorities. The ongoing debate about the financing of European infrastructural bottlenecks, or the laundry list of infringement procedures that are pending due to noncompliance of Member States with existing legislation, both support that conclusion. Though in theory the establishment of the Agency for the Cooperation of Energy Regulators (ACER) as a supranational regulatory authority may seem like a step in the right direction, its limited mandate and financial constraints confirm that formal decision-making powers reside at the national instead of the European level. This in turn confirms the asynchrony within the EU gas system, which is partly organized at the European level and partly at the national level, resulting in asymmetric information, ineffective institutions and unpredictable transaction costs.

In terms of future European energy policy making, with all pending infringement procedures it is currently difficult to determine the EU’s future needs. This confirms the necessity to implement existing legislation and subsequently assess whether additional legislation is required to make the EU gas system work. In terms of market development, the EU has been adopting a two/three speeds approach, which may prove risky. Interconnecting European Member States and investing in particular in Central, Eastern and Southern Europe is a prerequisite for the functioning of the entire energy system. Evidence from the US suggests that the EU may have several decades of institutional development ahead of it (a complex process due to EU integration dynamics, as all case studies show). That includes moving away from the oil-indexation of long-term contracts with suppliers towards for instance hub-based indexation, a process that seems to be taking place. Contrary to the US however, European Member States are expected to be dependent on external suppliers of natural gas. These, and most notably Russia, are therefore expected to remain crucial to the EU’s energy system for several decades.

1. INTRODUCTION

‘Natural gas is being found in abundance around the world’ (Yergin, 1988, p.120).

Background and Objectives

For decades natural gas was not an issue of major concern. Apart from squabbles between the first Reagan Administration and European leaders about increasing dependence of Europe on (then) Soviet natural gas, energy in general had a remarkably low profile in the period between the Oil Crises and the mid-2000s (see McGowan, 2011, p.491.). This changed when Ukraine and Russia could not solve a price dispute and the previous decided in January 2006 to seize supplies of natural gas to the EU.

Much has been written about who is to blame for this supply disruption and the one that followed in 2009, how real or perceived the risks are and subsequently what response options the EU and/or the individual Member States has/have (see for some recent contributions Smith Stegen, 2011; Schmidt-Felzmann, 2011; Le Coq and Paltseva, 2012). Yet it is worth noting that by now the EC openly acknowledges that the problem of supply disruptions and an acute lack of natural gas as experienced could have been solved if the internal energy system would have been functioning better, notably with more interconnection capacity, reverse flow options and storages facilities (European Commission, 2010). An adequate organization of gas distribution systems in Europe has been on the agenda for quite some time (Yergin, 1988). Hence the question is validated why apparently up to date the internal European gas system is not always functioning properly.

The aim of this study is to assess whether certain preconditions for efficient market functioning are in place. This is in contrast with more accepted econometric approaches of ex post price convergence analysis (e.g. Neumann and Siliverstovs, 2005; Renou-Maissant, 2012). These studies generally assess market integration by making an ex post analysis of prices in different markets. Over time converging prices are seen as a sign of well integrated markets. Several commentators have concluded that parts of the EU gas system are already reasonably well integrated (Harmsen and Jepma, 2011; Renou-Maissant, 2012; Heather, 2012). Yet in large parts of the EU this is arguably not the case, for a variety of reasons that are discussed in detail later. The institutional approach taken here aims to answer the basic notion whether natural gas can, under current conditions, flow throughout the EU, which may be required – if not dictated by price – because of the risk of supply disruptions. Instead of an ex-post analysis, it aims to determine ex-ante whether several components of the European gas system are developed to the extent that the market can function properly. In addition this approach aims to determine whether existing decision-making structures in the EU are adequate to allow for these components to develop properly.

Though predictions have to be taken with a grain of salt, with the increase of liquefied natural gas (LNG) transport and also the development of unconventional natural gas, it is generally assumed that natural gas is abundantly available in the next decades (International Energy Agency 2012a; International Energy Agency, 2012b). It is worth mentioning though that only some years ago scholars have warned for possible limitations to future natural gas production in the two largest suppliers of the EU, i.e. Russia and Norway, due to uncertainties regarding the required yet costly development of new gas fields in Arctic Russia and the Far East and a depletion in the potential for increased exports from Norway (Söderbergh et al., 2009; Söderbergh et al., 2010). On the other hand unconventional gas extraction, which is the topic of chapter 5 of this dissertation, is expected to substantially increase global supplies and its exports from the US, which are currently debated amongst US policy makers, most likely add to this expectation.[1] With the existing uncertainties it is difficult to assess exactly what amount of natural gas is going to be available on global markets. What is certain however is that the EU in this equation is going to be a net importer: the Netherlands and Denmark are the only net exporters on the continent and their production is in decline, while the United Kingdom and Romania are currently by and large be self-sufficient (European Commission, 2012). As is discussed in chapter 5 it is uncertain when and even whether large amounts of unconventional natural gas will be produced on this continent. It is safe to assume that even when that would eventually happen, large amounts of natural gas have to be imported. The Joint Research Center estimated in September 2012 that even if the unconventional natural gas potential in the EU were to be developed, this would only be sufficient to halt European import dependence at around 60% in the future (Pearson et al., 2012).

[1] The debate on US exports of natural gas in the form of LNG is discussed in more detail in chapter 5. In early 2013 legislation has been proposed that would allow for more exports of natural gas to so-called allies of the country under the Expedited LNG for American Allies Act - http://turner.house.gov/news/documentsingle.aspx?DocumentID=319118.

Whether the EU Member States can all equally benefit from future natural gas supplies is less certain, primarily due to slow market integration. The risks arising from the status quo regarding the EU natural gas system are at the basis of this thesis. It is hypothesized that a part of these risks stems from an asynchrony in policy making within the trajectory of liberalization of the gas market. While markets have been liberalized and operate primarily on a European level, other essential parts of the energy system (notably regulation and infrastructure) only occasionally do, though some recent improvements can be observed.

The EU gas system consists of four facets. These are, in arbitrary sequence: markets, infrastructural companies, governmental institutions and regulatory authorities. The market place is where the producers, suppliers, traders and consumers operate. This is where natural gas is supplied to both small consumers (retail) and large energy-intensive industries and where traders operate at energy exchanges and increasingly trade short-term (spot market) and long-term (futures) products. Infrastructural companies are in general publicly oriented companies. The most important reason for this characteristic is their natural monopoly position as the administrator of gas infrastructure. Governmental institutions, both national and supranational, set the ground rules for the playing field in which market players operate. Finally regulatory authorities monitor market players' behavior, guard over fair competition and decide over tariff changes and various other parameters in terms of for instance costs for the usage of infrastructure or appropriate technical standards.

An examination of government policies aimed at these different facets of the energy system shows remarkable differences. Within energy markets a clear trend of up scaling to the European level can be identified under influence of the Gas Directives.[2] In comparison, infrastructural companies and regulatory authorities operate mainly in their national domains. This asynchrony in levels of government intervention within the EU energy system is demonstrated in more detail in the third chapter of this thesis. The second chapter shows that this asynchrony is reflected in the academic debate on energy security as well. This suggests that a more integrated analysis of energy security in the EU is useful, taking into consideration all elements of the European gas system as just described.

[2] Starting with Gas Directive 98/30/EC.

The most important legislative documents regarding the EU internal market for natural gas come from European political institutions, in other words the EC and in some cases the European Parliament (EP), whereas their implementation is a matter of the Member States. Different interpretations of Directives and different pace of implementation have caused friction within the EU, as for instance the case of so-called unbundling of integrated energy companies has demonstrated. Some Member States, such as the United Kingdom and the Netherlands, have implemented this legislation more energetically than others like for instance France and Germany. The EC has never made a secret of her intentions, namely that ideally within the EU all integrated companies should ultimately be ownership unbundled.[3] Regulatory authorities and infrastructural companies are at the moment predominantly national domains, although some transgressing behavior is identified. It is therefore hypothesized throughout this analysis that existing decision-making structures within the EU are not always optimal. This is tested in different case studies, which are discussed later. To limit the scope of this research project the focus is on the EU gas system, though relevant parallels with the electricity system seem to exist.

[3] See the considerations 9 – 12 of Electricity Directive 2009/72/EC that state for instance that 'without effective separation of networks from activities of generation and supply (effective unbundling), there is an inherent risk of discrimination not only in the operation of the network but also in the incentives for vertically integrated undertakings to invest adequately in their networks.'

Ownership unbundling in the Netherlands

Taking a closer look at the Netherlands' energy history, the government has been rather active in implementing both Electricity and Gas Directives. Yet comparing the gas market and the electricity market, some differences remain and lines between public and private activities sometimes remain thin.

The national grid operator for electricity TenneT is a wholly owned public company focussing solely on grid activities for networks of 110 kV and up. When purchasing German Transpower of E.ON AG in 2010 it became the first grid operator for electricity that crossed its national border. TenneT is the major shareholder (holding 56,1% of the shares) in the Dutch-Belgian energy exchange APX-ENDEX. The aim is to offer platforms to help increase the liquidity of the market.

In the Dutch gas market – as in many gas markets – the situation is complicated. Until 2005 all Dutch activities in the gas market were concentrated under the umbrella of NV Nederlandse Gasunie, a public-private partnership between the Dutch state, Shell and Exxon-Mobil. With the implementation of the Second Gas Directive, this partnership was divided into a trading company called GasTerra and an infrastructural company called Gasunie. The latter is however not entirely publicly oriented, for its transportation duties are carried out by Gas Transport Services, or GTS, but Gasunie is also involved in commercial gas storage, for instance through Zuidwending in Veendam, and participates in an LNG terminal, i.e. the GATE terminal in Rotterdam. Finally Gasunie holds 20,1% of the shares in energy exchange APX-ENDEX and 9% of the shares in NordStream.

Often the Dutch Gasunie is referred to as the public Dutch infrastructural company and in fact it is. However, some of its activities remain commercial.

Box 1. Ownership unbundling in the Netherlands.

As is demonstrated in chapter 2, most of the debate about energy security revolves around the availability of sufficient supplies, reliability of suppliers and / or supply routes. It seems however that energy security cannot be labeled as a question of sufficient supplies or resources alone, given the current proven reserves / (un)conventional potential and considering a regular annual demand growth. For the EU it is unmistakable that future gas supplies increasingly consist of pipeline flows (from in particular Russia, Norway and Algeria) and LNG imports, while domestic production is in decline, notably in EU's major producer the Netherlands with -2.5% per annum from 2007 – 2030 (down to 43 bcm in 2030) and in the United Kingdom with -6.0% per annum (down to 19 bcm in 2030) in that same period (IEA, 2009, p.429). This thesis comprises the notion that future EU energy security is not only a matter of sufficient supplies or reliability of suppliers, but also a matter of the ability to get these resources throughout the EU to their destination.

A growing number of studies make reference to the US gas system, albeit mainly with reference to investments in gas infrastructure (Von Hirschhausen, 2008) or for market structure and functioning more in general (Ascari, 2011; Vazquez et al., 2012). There is a widely held view that this is the only integrated and well-functioning gas system in the world (De Vany and Walls, 1994). There is much less agreement whether the EU can or should aim to develop itself in a similar direction as the US has done, as is discussed later in this thesis. Yet it is argued here that there are two important reasons to involve the US gas system in this analysis. The first has been mentioned briefly: globally the US gas system is perceived as being the only well-functioning gas system. Hence, despite the myriad of differences (which are discussed in the case studies), there may be lessons to be learned for Europe. Moreover, some recent developments in the EU, most notably the increase of spot-market trade and the decline of long-term oil-indexed contracts with natural gas suppliers (to be discussed in more detail in chapter 6), suggest that European policy makers and thinkers are actively looking at the US-model as some form of model for the future. Second, the US has a federal structure, and as such shows resemblance with the European model of governance. It is uncertain whether the EU will eventually develop into a federation, but this can be considered as one plausible scenario. Therefore, examining and where possible comparing existing decision-making structures in these two gas systems are deemed relevant. In line with Makholm (2012) it is hypothesized that the European gas system is currently not functioning properly, because too many issues are addressed at a suboptimal level of policy making, albeit because institutions are not developed, or their mandates are currently inadequate.

To provide a detailed account of the different facets of the European gas system as described earlier, several case studies are proposed. The third chapter of this thesis comprises an overview of existing European energy policy and hence aims to shed light on existing regulations and mandates for European institutions and individual Member States. While one of the most urgent problems for gas systems in the EU is generating a sufficient appetite for investment in infrastructure (Pelletier and Wortmann, 2009; European Commission, 2011), the fourth chapter of this thesis examines the investment climate for gas infrastructure, and related decision-making structures. Since many of the existing uncertainties in global gas systems can be linked to a phenomenon that has widely been labeled as the shale gas revolution (Trembath et al., 2012; Boersma and Johnson, 2012) and some of the European

Member States indeed may have substantial recoverable reserves of so-called unconventional natural gas under their soils, shale gas extraction is the subject of chapter 5. Some commentators have been rather optimistic about the ability of European institutions to mobilize Member States to accept a more collective approach regarding energy policy and energy security (McGowan, 2011; Trombetta, 2012). Yet it is argued here that the completion of the internal gas system is a long-road ahead and that existing decision-making structures may not be sufficient to complete this journey. Hence in chapter 6 several other components have been selected to complete the ex-ante analysis of the EU gas system. These are, in arbitrary sequence, the available and planned infrastructure capacities, the implementation of existing legislation, market trade and long-term contracts and the role of liquefied natural gas (LNG). Chapter 7 presents conclusions in terms of EU energy security and energy policy.

The theoretical foundation for this research is laid out in the second chapter. First, a state of the art overview of energy security studies is presented. Although a wide though incomplete selection of literature is by definition arbitrary to an extent, the overview demonstrates that the bulk of academic contributions on energy security focus on diversification of supplies and (unreliable) suppliers. These fall in the category ‘markets’ that has been described earlier, as part of the energy system. Fewer contributions however focus on infrastructure and regulation. Therefore, indirectly this theoretical overview justifies the partial focus of this research on those two facets of the European gas system. The chapter then proceeds with an overview of (neo)functionalist theory and also touches upon new institutional economics literature to answer for both the ex-ante analysis of institutions in the European gas system, as well as underline the importance (and to an extent functioning) of decision-making structures in the EU. Subsequently chapter 2 concludes with an overview of multilevel governance, which is presented as a suitable framework for analysis more than a theory of European integration. The latter debate falls beyond the scope of this research and is therefore only briefly touched upon. The section does answer for the choice of this framework of analysis, its limitations and also its suitability for application to the benchmark, i.e. the US gas system.

Problem Formulation, Research Questions and Structure of the Research

Considerations in the previous paragraphs lead to the following problem formulation.

> Is European Union energy supply at risk because too many decisions are taken at a suboptimal level of policy making?

Several research questions follow from this problem formulation.

1. What is the status of European Union energy policy in terms of its components markets, infrastructure, governmental institutions and regulation that comprise the European Union energy system?

2. What can be said about the European Union's current decision-making and implementation structures on energy, and natural gas in particular?

3. From a (neo)functionalist and new institutional economics perspective, what can be said about the observed asynchronies within the European Union energy system?

4. Using a MLG framework to analyze decision-making structures in both the European Union and the United States, what lessons can be learned from the selected case studies?

5. What conclusions (in terms of future policy making) can be drawn from the results of this study in terms of European Union energy security?

These questions are addressed in the final chapter of this thesis. Figure 1 gives a schematic overview of the structure of the research.

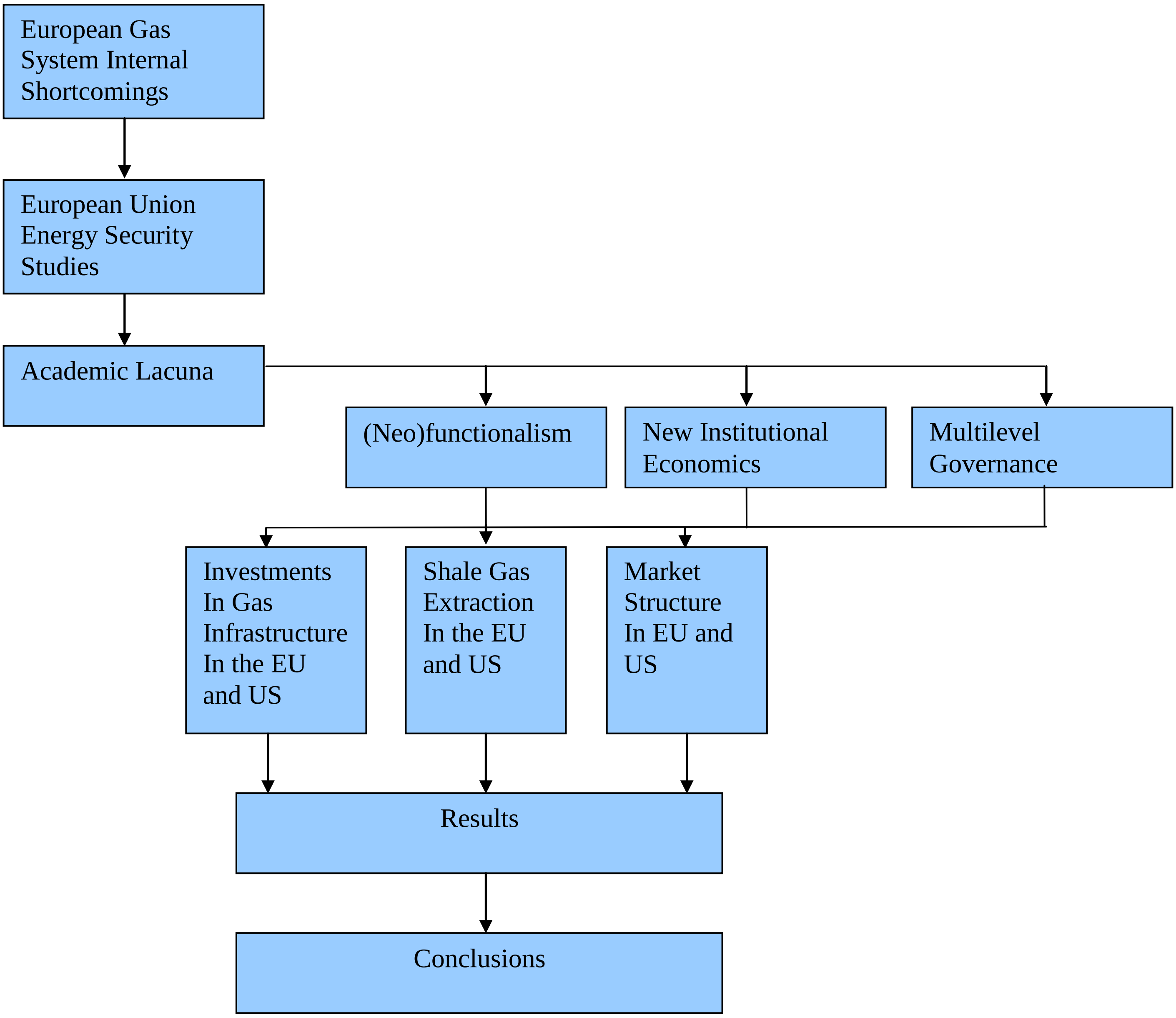

Figure 1. Structure of the research.

2. THEORETICAL FRAMEWORK

Introduction

This chapter introduces the framework for analysis that is used in this study. The first section gives an overview of energy security studies, a long-debated and often-disputed concept. This section demonstrates that most academic contributions that deal with energy security focus on energy markets (i.e. diversification of supplies, unreliable suppliers and transit risks), whereas other components of the energy system such as infrastructure and regulatory authorities are relatively under exposed. That asynchrony is further explored in the third chapter of this study, which presents an analysis of the status quo of EU energy policy and clarifies the current decision-making and implementation structures within the EU regarding this matter.

The second and third section of this chapter elucidate on the theories used in this study to analyze the case studies. Successively these sections give a brief overview of neo-functionalism as one of the main streams in European integration theory and its links to energy security studies. This section also touches upon work from new institutional economics scholars, which is linked to this line of international relations (IR) studies. Subsequently this chapter outlines the concept of multilevel governance (MLG), which applies several components of neo-functionalist thinking. Although the merits of MLG as a theory have been fiercely debated, the conceptual framework provides a useful scheme to analyze the different case studies in the continuation of this thesis.

Energy Security Studies

‘This is one of the most overused and misunderstood concepts in the energy debate’ (Helm, 2002, p. 175).

The debate on energy security has not passed unnoticed, but so far the only thing that stands out from the results is a lack of consensus about pretty much all aspects of energy security, or as Chester (2010) concluded, energy security is a ‘wicked problem’. First, two concepts can be distinguished, i.e. energy security and security of supply. Some authors even use these terms interchangeably (Van der Linde et al., 2004; Kruyt et al., 2009). The remark of Kruyt et al. that these concepts are ‘synonyms’ seems questionable, if only for the latter focuses on supply, while energy security at first glance seems to be open for more interpretations (e.g. necessary investments in infrastructure, technological development, regulatory challenges and stable demand). In the available literature there is a preference for the concept labeled energy security (when counting the number of references that is). So, for the sake of clarity this thesis uses that concept. When referring to authors that have labeled the concept ‘security of supply’ (e.g. Helm, 2002; Chevalier, 2006; Correljé and Van der Linde, 2006) here the term energy security is used in order to avoid disorder.

The renewed interest in energy security, following disruptions in Russian gas deliveries to the EU and an increasing pressure on global resources following the growth of in particular China and India, has resulted in an outgrowth of interpretations of the concept, proposals for frameworks, conceptual considerations and admonitions and crisscross usage. At the beginning of this section it seems appropriate to recap that proven global gas reserves and legitimate expectations about unconventional gas reserves make that at current rate of consumption over 130 years of gas consumption is ‘likely’ (Bothe and Lochner, 2008).[4] According to IEA estimates the worldwide recoverable conventional gas reserves are around 400 trillion cubic meters, as are global unconventional gas reserves, a number that would at current rates of consumption be sufficient for 250 years of consumption.[5] In short, there is plenty of natural gas.

To start with the conceptual considerations, that go as far as questioning the meaningfulness of the concept itself (Clawson, 1998), international relations scholars focusing on security theory have expressed concerns about the compatibility of energy and security, for potentially coupling the two can result in a panoptic view, in other words ‘energy security means the security of *everything*: resources, production plants, transportation networks, distribution outlets and even consumption patterns; *everywhere*: oilfields, pipelines, power plants, gas stations, homes; *against everything*: resource depletion, global warming, terrorism, ‘them’ and ourselves’ (Ciutâ, 2010).

[4] The term ‘likely’ has been translated from a German publication, where the word ‘wahrscheinlich’ was used (p. 22).
[5] http://www.iea.org/aboutus/faqs/gas/ - Website last accessed on 31 March, 2013.

In some instances energy resources are seen as a cause or an instrument of conflict (e.g. Klare, 2001). Yet the evidence for this position is not convincing, in particular when causality between energy and conflict is concerned and energy resources are identified as the primary cause of conflicts (Klare, 2001) in what others labeled the ‘last Great Game’ (Milina, 2007). Empirical data on this causality between conflict and energy is generally scarce. Recent attempts to study terrorist attacks on energy infrastructures indicate that these attacks are ‘comparatively few’ and that the ‘low percentage of attacks relative to other target types indicate that EI’s are not a primary object of terrorist groups’ (Toft et al., 2010).[6] Such an example nuances arguments that NATO must ‘play an increasing role in energy security’ and ‘can provide an added value…in the area of physical protection of energy infrastructure…’ (Tagarinski and Avizius, in Stec and Baraj eds., 2009, p. 28). Considering the research by Toft et al. this allocation of new tasks to NATO has at least a gleam of self-interest to it, or, as Belkin (2008) put it: ‘…for some, NATO has the ability to secure the energy infrastructure of such countries…’.[7] Next to these concerns about the necessity to involve NATO in energy security, it may also be worth considering the sheer reality of that mandate, which – with ten thousands of kilometers of pipelines, storage facilities and production facilities – seems overambitious.

Ciutâ (2010) refers to the usage of energy resources as a means of pressure, for instance in case of political conflict. An example of this is the gas supply disruption following the conflict between Ukraine and Gazprom in 2009 over payments in arrears, or at least ‘a big part of the problem was Naftogaz’s failure to clear debts for gas delivered’ (Pirani et al., 2009, p.15).[8] Smith Stegen (2011) concludes that these supply cut-offs must be attributed to economic causes and that over the course of history Russia more often than not failed to achieve political concessions using its energy resources as a ‘political weapon’. Regardless, this dispute between Ukraine and Russia had far going consequences for citizens in countries like Bulgaria, urging the EU and national policy makers to propose additional regulation.[9] Högselius (2012) concludes that economic considerations have always been more important than political considerations in Russian-European energy relations, but that this does not mean that the ‘energy weapon’ does not exist. He argues that its concept however requires a broader

[6] EI’s stands for energy infrastructure in this article (p.4411).
[7] Here Belkin refers to Partnership for Peace countries such as Turkmenistan and Kazakhstan (p.102).
[8] This is Ukraine’s leading gas and oil company.
[9] For instance Regulation 994/2010 on security of gas supply, which is discussed in more detail in chapter 3.

view, and move beyond supply disruptions, to include issues such as dumping natural gas on European markets, divide and rule strategies in which certain customers are favored over others, and so on (Ibid., p.7).

What is problematic about the examples above and the subsequent conclusions in terms of threat, conflict or even war is that they leave the impression that incidents are used in order to frame political debates and serve to justify certain policies. Goldthau (2008a) straightforwardly puts that energy weapons are ‘fiction’, stating that resources theoretically can be used as a political weapon only when all producers collectively decide to block supplies. To him and other scholars the real challenges are in the lack of investments in Russia, to secure sufficient supplies for the longer term (e.g. Bothe and Lochner, 2008; Söderbergh et al., 2010). While this can be true when upstream investments are concerned, investments in infrastructure, in particular to diversify supply routes to the EU (think of Nord Stream and South Stream) are always perceived with suspicion and regularly lead to accusations of ‘geopolitical aggression (by Russia) against CIS countries and new Member States’ (Stern, 2009a).

An anecdote that supports the position of energy weapons being a fiction dates from the First Oil Crisis, when allegedly the Soviet Union – as one of the main oil producers – was requested by the OPEC members to cease its oil supplies to the states under embargo. Although one could have expected that ideological motives at that time would be decisive for the Soviets to make a decision to punish their capitalist counterparts across the Atlantic, with the sky-rocketing oil prices on the world market they decided the opposite, namely to increase their sales to amongst others the US and the Netherlands (Goldman, 2008). Of course also from this perspective the question is legitimate whether these examples exemplify a trend or are merely incidents. For some the fact that Russia ‘has been a reliable supplier to the EU even during the Cold War and periods of great domestic difficulty for Russia bears repeating…’ (Monaghan, 2007) as is confirmed by Smith Stegen (2011, p.6506).

All these considerations and conclusions fold into the theoretical debate whether energy resources have been securitized or not. Following the Copenhagen School of security studies, certain ‘existential threats’ give legitimization for actions that are outside the normal political process (see Buzan et al., 1998). In other words, an energy supply disruption is considered to be an emergency and this validates the usage of any means necessary to restore it. There is ongoing debate whether this line of reasoning applies to the EU, in light of supply cut-offs in the 2000s. Trombetta appears to halt between two opinions, describing responses of the EC following the supply disruption in 2009 as a 'securitization move' (2012, p.21) but also acknowledging that it can be questioned whether this example represents a case of politicization rather than securitization (2012, p.22). McGowan makes an argument that disputes between Europe and Russia are better understood as being played out in a framework of politicization rather than securitization (2011, p.488). In a comparison between the recent gas dispute and the 1970s Oil Crises he indicates that although in both instances governments declared a state of emergency, these moves focused on the allocation of resources and not a broader security agenda (Ibid., p.493). It is worth noting however that opinions may vary substantially across Europe on the question whether energy resources are securitized or merely politicized. Roth (2011) indicates that the Polish discourse regarding energy resources is highly securitized, with regular reference to notions of military security. This is for instance reflected in the Polish (failed) attempt to initiate a European energy security treaty, along the lines of NATO (Ibid., p.612). Other contributions have pointed at historical reasons for this divergence in approaches to reliance on Russia between Eastern European Member States and others (e.g. Schmidt-Felzmann, 2011; Johnson and Boersma, 2013). One of the outcomes of the debate following the 2009 gas supply disruption has been the inclusion of 'energy solidarity' in the Lisbon Treaty (see Roth, 2011), though Schmidt-Felzmann questions to what extent this serves individual Member States' interests or the European collective interest (2011). Regardless, in terms of securitization, it is worth noting that nowhere in the Lisbon Treaty it is confirmed that a threat to energy solidarity (or energy security for that matter) has to be prevented by any means necessary, rather that it is something Member States strive for.[10] Furthermore Member States' individual sovereignty cannot be affected by this inclusion in the Treaty. All this is in sharp contrast to for example the Carter doctrine, which left not much room for imagination.[11] In this statement, the then President Carter of the US made clear that US oil interests in the Middle East would be protected if necessary, for '…An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be

[10] Lisbon Treaty, article 176A sub 1.
[11] See for a blog reference http://www.worldaffairsjournal.org/blog/andrew-j-bacevich/carter-doctrine-30

repelled by any means necessary, including military force.' That appears to fit the Copenhagen School definition of securitization.

Another example that demonstrates the level of rhetoric when Russia is concerned is the outcry for diversification.[12] Different outlines of diversification have been identified in relevant literature. First, some have called for diversification of supply routes through which natural gas is transported to the EU, but this raises additional questions (Belkin, 2008). Russia has made it clear that initiatives to diversify away from the Russian supplies are not welcome (Kalyuzhny, in Kalicky and Goldwyn eds., 2005; Krestyanov, 2008).[13] Russian authorities have actively undermined the European Union backed project of the Nabucco pipeline by closing deals with for instance Hungary and Serbia in order to make investment in this route financially unattractive and make their own project South Stream profitable (Belkin, 2008).[14] Following empirical results of an evaluation of the Nabucco project Russian attempts have so far not succeeded, at least in terms of demand from gas shippers and cost-effectiveness, which are positive for the project (Pickl and Wirl, 2008). However up till now the question remains unanswered whether there are sufficient alternative suppliers next to Russia to make Nabucco a success – or to make an investment decision worth approximately € 5 billion to start with. From this perspective it is not helpful that one major potential alternative supplier, Iran, has been excluded from economic activities. Furthermore, the Caspian Region poses serious security challenges in itself that must not be underestimated (Monaghan, 2007). The necessity of Nabucco has been linked to the proper functioning of the liberalized European gas system as a whole, since without this pipeline market functioning in Central and Southeastern Europe 'could hardly have been realized' (Umbach, 2009). If, as this scenario presumes, a fragmented European Union gas system will otherwise emerge, one could also consider possibilities to counteract this internal fragmentation of the system, for instance through proper investments in interconnection capacity, a strategy echoed in recent European policy documents (European Commission, 2012). It is worth noting that some have concluded that Europe's risk

[12] The idea to diversify the EU energy supply dates from the 1991 Energy Charter Declaration, which was followed in 1994 by the Energy Charter Treaty (legal status acquired in 1998). Arguably the most evident example of this EU strategy nowadays is the intended Nabucco pipeline, which disregards the Russian territory and aims to transport natural gas from the Caucasus through Turkey into the EU.
[13] For the relevant interview, visit http://www.euractiv.com/en/energy/eu-wrong-prioritise-energy-diversification/article-176380
[14] This pipeline intends to bring natural gas from the Caspian Region to Europe without transiting Russian territory. At the end of 2008 Russia closed its deal with Serbia – Financial Times, 24th December 2008.

exposure to gas deliveries from Russia did not increase over the period of 1998 – 2008, yet that there is dispersion between European Member States that is further widened because of new transit routes such as Nord Stream (Le Coq and Paltseva, 2012).

The second form of diversification deals with energy suppliers. The EU seems rather diversified when it comes to natural gas, given significant own resources and imports from in particular Russia, Norway and Algeria (IEA, 2008). Constantini et al. (2007) indicate that Europe is well located in the world market to benefit from increased exports of natural gas in the form of LNG from both Africa and the Middle East. Yet Monaghan argues that shifts to other suppliers of natural gas are not necessarily reducing energy dependence, since most oil comes from those regions as well; in fact this shift may increase European Union energy dependence on the Middle East (2007).[15] Cohen et al. (2011) have, in a study of OECD countries' energy security measured in diversification of oil and gas supplies, concluded that most countries have realized diversification of gas suppliers since 1990.

An additional risk is that European initiatives to neglect Russia as a supplier undermine Russian expectations that the EU will remain a reliable consumer in the future, which can result in a lack of investments and a Russian search for diversity away from European consumers (Monaghan, 2007; Stern, 2009a). This would frustrate key investments in exploration of new fields, infrastructure and interconnections between markets (Goldthau, 2008a). More broadly speaking, security of demand should be treated as an integral part of energy security (Cohen et al., 2011). In the end the attempts of the EU to move away from Russia could freeze the highly necessary investments in the Russian energy sector and hence turn the perceived negative dependence on Russian energy into a self-fulfilling prophecy. The suggestion of Banks (2007) that – given the long-term return on investment in gas projects and the necessity of investment in the Russian gas sector – the EU should consider lending funds to Russia to invest in exploration and transportation capacity, while collecting these loans over a longer period in the form of natural gas, could be more valuable from this viewpoint.

[15] Russia possesses the most conventional resources of natural gas, followed by Iran, Qatar, Saudi Arabia and the United Arab Emirates.

The final form of diversification deals with energy resources. Again, the EU *is* rather diversified, looking at for instance the European energy mix. Next to considerable shares of oil and natural gas, coal-fired and nuclear plants each provide about one third of European electricity generation, alongside an increasing share of renewable energy (Belkin, 2008).

The previous paragraphs have given a brief demonstration of the rhetoric character that is penetrated in the debate on energy security. Going back to the pile of literature on this topic, at least two (because of overlap somewhat arbitrary) clusters of academic focus can be identified. First there are multiple contributions regarding the concept of energy security, i.e. what it means and / or what a definition could be, sometimes with specific reference to the EU (Bohi and Toman, 1996; Van der Linde et al., 2004, chapter 2; Yergin, 2006; Chevalier, 2006; Kruyt et al., 2009; Hughes, 2009; Chester, 2010; Umbach, 2010; Roth, 2011; McGowan, 2011; Trombetta, 2012). The second cluster comprises contributions that focus more on EU energy policy, what policies are in place, an analysis of energy security or what future scenarios could unfold (Helm, 2002; Meyer, 2003; Van der Linde et al., 2004; Correljé and Van der Linde, 2006; Scheepers et al., 2006; Constantini et al., 2007; Von Hirchhausen, 2008; Nutall and Manz, 2008; Pirani et al., 2009; Söderbergh et al., 2009; Pointvogl, 2009; Gasmi and Oviedo, 2010; Söderbergh et al., 2010; Cohen et al., 2011). On existing policies also extensive primary data are available, in terms of legislation, communications from European institutions or even publications from European representatives (e.g. Oettinger, 2010).

To start with the first cluster, Bohi and Toman (1996) employ an economic viewpoint in their definition of energy security, namely 'the loss of economic welfare that may occur as a result of the change in the price or availability of energy'. Over time they identified that 'complex vulnerability issues' have been added to the traditional connection of energy security with dependence on oil imports. This links closely to the 'classical' definition of energy security, namely 'the availability of sufficient supplies at affordable prices' (International Energy Agency, 2001). Several authors added to this definition the notion that different countries have different interpretations of the practical meaning of this definition (e.g. Yergin, 2006; Chester, 2010). Yergin (2006) argues that several occurrences such as power blackouts in the US, threats to attack energy infrastructure by Al Qaeda, concerns over the Iranian nuclear program, disruptions of gas supply in 2005 in Europe, growing resource nationalism, skirmishes in Nigeria and nature forces by the name of Katrina gave sufficient cause for a fundamental revision of the traditional definition of energy security. It is worth considering that according to Toft et al. the terrorist attacks have not taken place on a relevant scale (2010), the supply disruptions have been downplayed by several commentators (e.g. Smith Stegen, 2011), forms of resource nationalism is found all over the world (chapter 5 discusses the debate in the US about the export of natural gas) and ecocatastrophes cannot be controlled. Hence, Yergin's argument can be nuanced to an extent.

Chevalier (2006) considers energy security to be 'the whole physical and nonphysical supply chain'. This includes reliable supply, transport and distribution of energy for a reasonable price. Several commentators underline the importance of the time dimension of the concept, since short term energy security can be threatened by political decisions, accidents and strikes, whereas structural political turmoil or insufficient investments can affect long term energy security (Chevalier, 2006; Chester, 2010; Söderbergh et al, 2010). Yet according to Helm (2002) 'supply can almost always be made equal to demand, provided the price is allowed to adjust. Only in extreme circumstances, such as embargoes, strikes or wars, is energy physically unobtainable'. This approach seems most realistic, for it distinguishes between threats to a stable supply that are open for human influence and control and extreme circumstances that require case-specific measures.

Focusing on the European approach to energy security, Chevalier (2006) reports that the EC for several years favored to add uncertainties to the energy debate, such as climate change, geopolitical uncertainties, regulatory uncertainties and 'the unexpected' . In addition Umbach (2009) argues, following the supply disruptions of 2006 and 2009 that the European approach towards energy security required to be drastically changed. Several authors conclude that one approach to energy security ought to be adopted and acted upon by all levels of government involved (Chevalier, 2006, p. 18; see also Le Coq and Paltseva, 2012, p.648, who refer to a common standard of supply security for European Member States). Yet at the same time there is substantial agreement that the concept changes over time (Yergin, 2006; Chevalier, 2006; Chester, 2010). It seems questionable whether including all the mentioned themes under one umbrella can actually help to solve the problem, especially when this problem appears to be redefined constantly. In addition there is no consensus about which challenges and uncertainties should be included when studying energy security. From this analysis it follows that so far stable and sufficient supplies for reasonable prices are about the only elements in the different definitions of energy security that have endured the course of time.

One thing that stands out from the available literature is (when considering the four facets of the European Union energy system as discussed in the introduction) that there appears to be a lot of attention for both markets and governmental institutions. Chester (2010) confirms this observation, reporting ‘an almost overwhelming focus on securing supplies of primary energy sources and geopolitics’. On occasion infrastructure and regulation have been mentioned, for instance when referring to massive investment programs in infrastructure that are necessary in the next decades (Umbach, 2009), when network security is mentioned as one part of energy security (Helm, 2002; Chevalier; 2006), or the alleged lack of investments in Russia that is a potential threat to EU energy security (Goldthau, 2008b; Bothe and Lochner, 2008; Söderbergh et al., 2010). Some have identified the incomplete liberalization of the EU energy system as a risk (Chevalier, 2006) while others blame liberalization to be the driving force in delayed investments in infrastructure and hence pose a threat to energy security (Meyer, 2003). As mentioned earlier several authors have also looked at energy infrastructure from a military perspective (Yergin, 2006; Tagarinski and Avizius, 2009; Toft et al., 2010), but only few studies focus on gas infrastructure and regulation as being part of a well-functioning energy system and contributing explicitly to energy security (an exception being Jamasb and Pollitt, 2008). In a nutshell their results suggest that energy security can be strengthened by regulation that adequately stimulates investment in necessary infrastructure, albeit pipelines, storage facilities or interconnection capacity. This leaves a crucial task for the regulatory authority, which searches for a balance between ensuring investment and reasonable tariffs from a consumer’s perspective. Jamasb and Pollitt focus on the electricity market, although the stimulation of investments in gas storage facilities in Belgium and the United Kingdom is touched upon (Ibid., p. 4586). As is discussed in more detail in chapter 4 of this thesis, there is a wide range of literature on the regulation of the natural gas system, focusing on sufficient infrastructure investment in a liberalized gas system (e.g. Von Hirchhausen, 2008; Gasmi and Oviedo, 2010), though links to energy security are scarce.

Chapter 3 demonstrates that the EC has (partly) broadened its focus from securing supplies to also include gas infrastructure and regulation, but in the academic literature the importance of gas infrastructure or infrastructure in general is frequently ‘overlooked’ (Jamasb and Pollitt, 2008; Hughes, 2009). This is confirmed also by the overview below, which aims to indicate where the aforementioned theoretical contributions predominantly focus on.

	EU ENERGY SYSTEM				
	Markets	**Infrastructure**	**Regulatory Authorities**	**Governmental Institutions**	**Definition or Concept of Energy Security**
Belkin	X			X	
Bohi and Toman	X				
Bothe and Lochner		X			
Chester					X
Chevalier	X	X			X
Ciutâ					X
Clawson					X
Cohen et al.	X				
Constantini et al.	X	X			
Correljé and Van der Linde	X				
Dehousse	X				
Gasmi and Oviedo		X	X		
Goldthau	X	X			
Helm	X			X	X
Hirchhausen		X	X		
Hughes	X	X		X	
Jamasb and Pollitt		X	X		
Kalicki and Goldwyn	X			X	

	EU ENERGY SYSTEM				
	Markets	**Infrastructure**	**Regulatory Authorities**	**Governmental Institutions**	**Definition or Concept of Energy Security**
Kruyt et al.					X
McGowan				X	X
Meyer	X			X	
Milina	X			X	
Monaghan	X				
Nuttall and Manz				X	
Pickl and Wirl		X			
Pirani et al.	X				
Pointvogl	X			X	X
Roth				X	X
Scheepers et al.	X			X	
Söderbergh et al.	X				
Stec and Baraj				X	
Stern	X				
Toft et al.		X			
Trombetta				X	X
Umbach	X				
Van der Linde et al.	X				X
Yergin	X				X

Table 1. Overview of the main focus of the examined theoretical contributions on energy security.

In sum, energy security is and remains a contested concept. One element that returns in all contributions is the sufficient availability of affordable energy supplies. Another point of consensus seems to be the change of the concept over time and the different interpretation it receives in different circumstances. What can be confusing for observers is the oft-quoted terminology of ‘markets’ in energy related studies. In several cases it is not explicitly mentioned what part of the energy system (markets, infrastructure, regulatory authorities, government institutions) is dealt with. The discussion furthermore suggests that the framework of security does not fit energy as such. Even though it is often used, in practically all cases it is questionable whether the issue has in fact been securitized or merely politicized. What also stands out is the relatively modest attention that is given to two crucial elements of well-functioning energy systems, namely sufficient infrastructure and regulatory authorities. There are abundant contributions on infrastructure that take a more regulatory economics perspective (as is discussed in chapter 4) but those contributions generally do not focus on energy security. The academic focus on the availability of energy resources is especially interesting given the establishment that natural gas is abundantly available. All this leaves the question open whether supplies, although at the center of the academic debate on energy security, may in fact not be the most acute challenge for the EU. This is considered in chapter 7 of this study.

The next section turns to the following building block of the theoretical framework, namely (neo)functionalism and new institutional economics.

(Neo)Functionalism and New Institutional Economics

Functionalism as a theory of international relations arose parallel to the development of regional and global interdependence. Whereas interdependence appeared to make issues complex – given for instance the broad variety of cultural and ideological differences – functionalism aimed to dismantle these complex issues until the technical aspects remained, in order to be able to organize issues at a certain required scale. The predecessor of the EU, the European Coal and Steel Community, was even defended politically with rhetoric based on functionalism (De Wilde, 1991), although its successor neo-functionalism and the founding architects of the European Community have also been connected to each other (Rosamond, 2000, p. 50). To Mitrany the continuous development of common activities and interests across territorial borders was the only way to make those borders irrelevant (1965).

Functionalism encircles two basic principles, namely form follows function and spill-over (Mitrany, 1965). The first principle leads to the conclusion that there is no such thing as a blueprint to solve an issue. Rather the characteristics of that issue had to determine the approach to the problem at hand, instead of political interests for example. Following this reasoning some needs would best be served by ignoring the conventions of national territory (Rosamond, 2000, p.33). This distinction between technical and political aspects of an issue has been criticized for its rather subjective nature. In addition one could wonder how realistic it is to dispose an issue from its ideological and political content, when all people and institutions involved actually carry and maybe even *form* that very same content. De Wilde (1991) suggested that an enrichment of functionalism would be to specify for whom something is functional and to what purpose.

The second principle of functionalism, called spill-over, deals with the expectation that cooperation on technical issues between states would have a de-escalating effect on power politics between those states. In other words, if actor A can collaborate with actor B on certain issue X, why would they slaughter each other over other issues? To Mitrany these joint functional arrangements formed the only serious roadmap towards more stable and peaceful relations between states (1975). Hence what functionalism shared with interdependence theory is the notion that the causes of war and the conditions for peace are located in the structure of society. The reduction of chances of war however was a bonus of the functionalist approach. Basically leaving the nation state as a given boundary and providing transnational institutions with the opportunity to serve as providers for welfare, had two effects, namely loyalty transfer away from the nation state and the bonus of reduction of the chances of international conflict (Rosamond, 2000, p.33). A question unanswered is what this would mean for the concept of a state as such. According to De Wilde (1991) many scholars criticized functionalism on this issue and Mitrany also seemed ambiguous, sometimes referring to broad functional political organizations but also to massive centralization in national government. One could wonder whether in fact there was a choice to be made here, or that different levels of government and governance could exist simultaneously. Yet throughout his work Mitrany also opposed regional integration arrangements, for regions would lead to the same faults of the state system, only at another scale (Rosamond, 2000, p.37). Following function instead of form, Mitrany would probably reason that incorporating Norway and Russia into some sort of EU energy cooperation makes more sense than excluding them. Yet the very notion of a 'union' constitutes a form – that is indeed not rigid and definitive – over function instead of the opposite.

In response to Mitrany and other functionalists, scholars like Haas and Schmitter began to doubt whether functional needs alone could in fact be sufficient to push forward regional integration. Functionalism suggested that integration would be steered by rationally established needs and a technocratic process would do the trick, but in fact that line of reasoning would rule out 'the political' (Rosamond, 2000, p.40). These so-called neo-functionalists argued that regional integration needed more: first, functional spill-over can take place only when integration happened in a functionally related area. Second there is pressure on the members of the collaboration in order to adopt a single policy, a process called externalization. Finally there is politicization, meaning the process by which regional integration is challenged among a widening circle of political actors (Schmitter, 1969, p.161). Hence a major distinction from functionalism was that neo-functionalists added to the technocratic process as described by Mitrany the active steering of the process itself by participants by 'pursuing their own self-interest' (Rosamond, 2000, p.55). But the line of reasoning of neo-functionalists went further. Next to advocating the advantages of integration, the newly built transnational institutions were also expected to be 'entrepreneurial' (Rosamond, 2000, p.58), a process which has also been labeled 'cultivated spill-over' (Tranholm-Mikkelsen, 1991). Subsequently, within the nation state, interest groups would experience the benefits of integration, accordingly acting positive towards their own national governments. Hence the process would get another stimulus from within the nation state, next to the catalyst function the transnational institutes fulfilled. It could be questioned though whether there is a limit on the willingness of national actors to promote spill-over. At a certain stage it would result in the complete transfer of power to another level, in this case that of the EU, hence undermining the influence and potentially the legitimacy of the national actor involved. As examined in more detail in the third chapter, a more European approach towards energy regulation in the form of the Agency for the Cooperation of Energy Regulators (ACER) has arisen in 2010, which potentially undermines the influence of national regulatory authorities by opening the door towards European regulation.[16]

Neo-functionalists had a major problem with the mechanisms that would steer transference of loyalty to a transnational political community, for to them this was mainly a technocratic

[16] See Regulation 713/2009, for instance article 8, sub. 1 a and b, stating conditions under which the Agency for Cooperation of Energy Regulators decides upon regulatory issues that fall within the competence of national regulatory authorities, which may include the terms and conditions for access and operational security.

process, whereas daily practice demonstrated that nationalism and / or politics could play a key role in the integration process.[17] This is where most prominent integration theories appear to struggle, for all seem to 'pick sides' explicitly: where neo-functionalists and supra-nationalists struggle with national influences and decisions to guide national sovereignty, intergovernmentalists have difficulties with the increasing role of European institutions and in particular their own initiatives, sometimes despite the interest of national governments. In this theoretical approach integration is often reduced to a single decision to integrate or not, whereas the process might deserve more attention, or 'integration must be conceived of as a process of action (decision to integrate) and reaction (response to integration)...since integration proceeds in stages, the dialectics of the process has to be given more attention' (Corbey, 1995).

Corbey discusses what she labels 'dialectical functionalism' as a framework to analyze European integration. It seems an amendment to neo-functionalism, for this theory does take the response to integration into account: the debated spill-over effect takes place and generally leads to reverse movement by Member States, i.e. safeguarding adjacent policy areas against EU intervention (Corbey, 1995, p. 263). In a nutshell the functional linkage suggested by neo-functionalists from this perspective is located at the *national* level. Integration in a certain policy area results in increased national government intervention in adjacent policy areas. This leads to policy competition between Member States, a movement that in the end can prove to be counterproductive. To give an example, it is worth considering the various speeds of implementation of the so-called Third Package of European legislation, in particular the Commission's desires regarding ownership unbundling.[18] A solution to break out of that status quo might be to transfer policy responsibility to the European level, but national interests so far hinder alternatives to develop and a significant number of Member States yet have to implement legislation that should have been implemented in the spring of 2011.

So what to deduct from this brief overview? First it seems fair to conclude that Mitrany's functionalism runs into political walls from the very beginning. European policy makers have opted for close cooperation on energy matters with important external suppliers. But in

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[17] Rosamond refers to the entry of the French president Charles de Gaulle (2000, p.67) but there are numerous nationalistically oriented movements of national governments throughout the EU that criticize further integration, although arguably with the purpose of in fact enhancing it.
[18] This resulted for instance in the acquisition of the two major electricity producers in the Netherlands, shortly after their unbundling had been effected.

particular regarding Russia the relationship remains fragile, which for instance becomes clear when considering the Third Package and its reciprocity clause.[19] Boussena and Locatelli (2013) have argued that this institutional divergence increasingly drifts Europe and Russia apart. Apparently both sides are taking different courses, despite the fact that both arguably would benefit from stable long-term mutual relations (in terms of secure supplies of natural gas and stable demand for it).

Second, neo-functionalists have struggled with the question who is actually steering the European integration process. As was briefly touched upon in the introduction and is discussed in more detail in chapter 3, regarding European energy policy it seems fair to state that both European institutions and Member States are in the driving seat. That is, European institutions have drafted ambitious statements from 1955 and onward, policy initiatives dating from the First Oil Crisis, and energy directives (amongst others aiming to liberalize markets) from the 1990s onward. At the same time, there is a certain degree of reluctance to implement this European legislation within several Member States, apparently driven by self-interest, the details of which are beyond the scope of this thesis. An example is the so far obstructed process of ownership unbundling, one of the crown jewels of the liberalization of European energy markets. It is reasonable to assume that national interests of both French and German integrated energy companies made sure that the Third Energy Package contained an acceptable alternative to full ownership unbundling, that was in fact desired by the EC (and already put in place by several other Member States, subsequently disturbing the European 'level playing field'). The EC has since been active in reaching its objective through a detour, as was for instance shown by former Euro Commissioner of Competition Kroes who made deals with German integrated energy companies RWE and EON to renounce a part of their networks, respectively its gas network Thyssengas and its electricity network Transpower, after allegations of abuse of market power.

By now it seems that the EC has shifted some of its attention to energy infrastructure and regulation instead of the markets, in its repeated calls for completion of the internal energy system by 2014 (European Commission, 2011; European Commission, 2012). The on-going

[19] Directive 2009/73/EC concerning common rules for the internal market in natural gas, as part of the Third Package, contains a reciprocity clause that was introduced into the third liberalization package in order to avoid indiscriminate acquisition of EU energy grids by third countries. This clause is widely regarded as targeting mainly Russian Gazprom.

debate within the EU about the role of the EC with regard to energy infrastructure and in particular whether or not European financial means have to be spent on these projects is fascinating. On the one hand – as dissected in chapter 3 – many of these infrastructural projects are currently delayed or worse, given different regulatory regimes, changing tariffs, costs and benefits that are not shared by Member States and so on, despite the fact that the market requires these projects to be realized in order to function properly. There are companies and countries involved that would like the EC to participate and help solve these issues and there are those, like the Netherlands, that are highly skeptical about any role of the EC in this matter. The argument is obvious: the Dutch transmission system operator Gas Transport Services has made major investments throughout the years in order to position itself in a favorable position to turn the Netherlands into a 'gas roundabout' (in short: a crossroads of gas flows through Northwestern Europe). If on the initiative of the EC alternatives such as a Belgian roundabout would be financed with European financial means that could be experienced as a distortion of competition.[20] The point here is that Member States based on their own interests or beliefs, correct and subsequently steer the energy policy initiatives of the EC. Whereupon daily practice demonstrates that the EC responds by altering its course, for instance when initiatives aimed at better market functioning (full ownership unbundling) stagnate and the EC subsequently focuses on other parts of the energy system instead, i.e. infrastructure and regulation. The example reiterates the importance that an analysis of regional integration should also place substantial emphasis on the role of non-state actors in providing the dynamic for further regional integration.

One of the fundamental issues in European integration theory is who or what is in fact steering the process of integration. That challenge goes beyond the scope of this thesis. Rather, it aims to demonstrate that the status quo brings additional risks in terms of European energy security and that particular risks that are easily overlooked come forth from existing institutional flaws. The importance of institutions for the success or failure of economic activity has been broadly acknowledged by scholars in the field of what has been called new institutional economics. The term 'new' is mainly used to distinguish between earlier work on institutions, and current work, the main difference being that institutions are now perceived to

[20] This arbitrary financing becomes clear when examining the European Economic Recovery Plan and its outcomes, which demonstrate that the financial means have been distributed across the EU, while some parts of the Union clearly could lay claim to the majority of those funds, because that is where objectively most investments are required. For more information on the EERP, see http://ec.europa.eu/economy_finance/publications/publication13504_en.pdf.

be susceptible to analysis (Williamson, 1998). In short, economists study the interplay of demand and supply and how that determines prices but neglect the context in which this interplay takes place (see Coase, 1998). Yet together with that standard constraint of economics institutions in fact are crucial in determining transaction costs, production and hence the feasibility of engaging in economic activity (North, 1991). Institutions in this context are both informal constraints (e.g. sanctions, taboos, customs, traditions, codes of conduct) and formal rules (constructions, laws, property rights) (Ibid., p.97). It is worth noting that generally speaking major changes in the rules of the game (formal rules) occur on the order to decades or centuries, with the occasional exception of a sharp break of established procedures following for example civil wars, perceived threats, financial crisis or perceived threats (Williamson, 2000). From that perspective it can be argued that the gas supply disruption in 2009 may not have been large enough to incentivize institutional change deemed necessary to make the EU internal gas system work. What is important here is that without solid institutional foundations a gas system cannot perform properly. It therefore makes sense to analyze existing rules in the EU gas system and establish whether the 'formal rules of the game are right', even though 'we are still very ignorant about institutions' (Williamson, 2000, p. 595). On the next page a schematic overview of new institutional economics is presented. The 'formal rules' (North, 1991) can be found on level 2, where instruments include 'executive, legislative, judicial and bureaucratic functions of government as well as the distribution of powers across different levels of government' (Williamson, 2000). Also of importance to this analysis of the EU gas system are governance structures, pictured at level 3. As the subsequent chapters demonstrate, it is at these levels of analysis where shifts between governance levels, compromises and subsequent vagueness prevail.

	Level	Frequency (years)	Purpose
L1	Embeddedness: informal institutions, customs, traditions, norms, religion.	10^2 to 10^3	Often non calculative; spontaneous
L2	Institutional environment: formal rules of the game – esp. property (polity, judiciary, bureaucracy)	10 to 10^2	Get the institutional environment right. 1st order economizing
L3	Governance: play of the game – esp. contract (aligning governance structures with transactions)	1 to 10	Get the governance structures right. 2nd order economizing
L4	Resource allocation and employment (prices and quantities; incentive alignment)	Continuous	Get the marginal conditions right. 3rd order economizing

Figure 2. Economics of Institutions (derived from Williamson, 2000, p.597).

The case studies aim to indicate what responses follow from integration in certain policy areas, next to the functional shift within decision-making structures. The next section explores the options to use a multilevel governance framework in this study to dissect the different case studies in the subsequent chapters.

Multilevel Governance Theory

The concept of Multilevel Governance (MLG) resulted from the appearance of the EU and was coined by Marks (1991). It consists of a vertical and a horizontal dimension. 'Multilevel' refers to the witnessed increased interdependence at different territorial levels while 'governance' refers to the identified growing interdependence between government and non-government actors at different territorial levels. The concept of governance is much broader than the more traditional government. The latter leans on more formal mechanisms such as sovereignty and constitutional legitimacy, while governance in addition rests on informal agreements, shared premises and successful negotiations. In other words, governance refers to 'any collectivity, private or public, that employs informal as well as formal steering mechanisms to make demands, frame goals, issue directives, pursue policies and generate compliance' (Rosenau, 1997).

MLG is not about integration (more about explaining policy making), but it does underline the notion that supranational actors, both public and private, and interest groups significantly contribute to the shaping of EC decisions (Bache and Flinders eds., 2005). Sometimes next to the term multilevel reference is made to 'poly-centric governance', in order to emphasize the functional dimension next to the territorial one (Schmitter in Diez and Wiener eds., 2003, p.49). In fact, MLG offers a polity-creating process in which authority and influence to make policies are shared across multiple levels of government (Hooghe and Marks, 2001). This contrasts with more state-centric theories in which governments are the ultimate decision-makers that transfer only limited power to supranational institutions to achieve specific goals. These governments from this perspective are nested in autonomous national arenas from where they determine EU policy making. In MLG, leaving from the starting point that there is no monopoly on the decision-making competencies in the EU, in order to explain policy making it is required to analyze the independent role of European actors such as the EC and the EP. In addition Hooghe and Marks (2001) have argued that through the process of collective decision-making follows self-evidently a loss of control for individual Member States. Instead of political arenas being nested, they are interconnected, hence the clear separation between national and international politics must be rejected. One could wonder why political actors would actively weaken institutions that they work for at a particular moment. According to Hooghe and Marks (2001) this is because these actors follow their own normative and private preferences. This observation on the two-level game between domestic and international interaction has been supported in other theoretical contributions. The complexity is caused since rational behavior at one policy level can be impolitic for that same player on another policy level (Putnam in Lipson and Cohen, eds., 1999). This apparent link between national and international politics resembles the theoretical contributions regarding so-called ‘linkage politics’ (Rosenau, 1969). To give an example, a certain topic might be too delicate for the domestic political arena and can subsequently easily be transferred to another level of policy-making. In addition that political actor could be searching for re-election and hence behave rather opportunistic at a certain moment.

Over time the concept of MLG has been refined into type 1 and type 2 MLG (Marks and Hooghe, 2003). The first is dominant among scholars who witness a modification of the traditional state and who recognize more intense transnational relations, an increase in the importance of public and private cooperation and hence in addition an increased importance of multinational companies. These scholars also retain the central role of the nation state. This type of MLG has originated from federalism in which a limited number of governments operate separately at different territorial levels. It suggests a certain hierarchy. These governments are the unit of analysis. Type 2 MLG refers to ‘task-specific jurisdictions’ in which scholars focus on a particular policy problem. In a nutshell citizens are not served by ‘the’ government, but by a range of different public service industries that form functional associations. These industries do not form a tight fit, but partly overlap. Both types of MLG are assumed to complement each other.

Many scholars have criticized (parts of) the concept of MLG from its start and there appears to be no consensus regarding its utility so far, as illustrated by Bache and Flinders (2005). Rosenau (in Bache and Flinders, eds., 2005) attributed certain use to MLG and acknowledged governance as a broader concept than government, which follows from the growth of complex interdependencies as a result of which rules are established in all sorts of non-governmental organizations as well. In other words, ‘states are no longer the only players’.

Another important issue following from MLG is what the role of the traditional state is or can become. Within MLG the state is one of the kids on the block, whereas its exact position in the hierarchy remains vague. In more state-centric approaches the EU is viewed as the appearance of a new supranational arena in which states attempt to pursue their national interests (Jessop in Bache and Flinders, eds., 2005). In this scenario the state in fact remains 'the' kid on the block. The shift of power to the supranational level, paradoxically orchestrated by national states themselves according to these scholars, can in the end result into an up-scaling of the traditional state to a supranational statehood. The process in between in combination with the increased complexity of relevant actors and the absence of legal frameworks within MLG is actually risky and a threat in terms of democratic accountability (Papadopoulos, 2007). MLG would not be the first analytical model to completely replace the state-centric perspective of governing in which constitutions are largely irrelevant (Peters and Pierre in Bache and Flinders, eds., 2005). Moravscik (1994) noted that some scholars tend to exaggerate the changes in intergovernmental relations and underestimate how easy states can strengthen their grip on a political process if considered necessary. In addition Member States of the EU can use MLG as a means of enhancing their independence from societal actors and can hence increase their steering capacity (Ibid.). MLG assumes that including more actors in the policy process does not have influence on the joint capacity to reach decisions, which is doubtful. Also negotiations within MLG are sometimes assumed to be non-conflicting, but how realistic is this? Peters and Pierre (in Bache and Flinders, eds., 2005) suspected that the lack of formal means of decision making could be a pitfall and warned that MLG could prove to be a 'Faustian bargain'.

One of the difficulties of MLG is its coordination dilemma: policies of one jurisdiction have spill-overs or externalities for other jurisdictions, which require coordination (Marks and Hooghe, 2003). Since all those involved are aware of this, it results in free-riding behavior being a dominant strategy of large groups within MLG systems. To limit this behavior one can reduce the number of autonomous actors (in fact type 1 MLG) or the interaction among them, which seems more difficult. It is questionable whether this dilemma is a persistent problem of MLG or more a temporary rigidity that comes with the process of relocating decisional powers from a central level to multiple central levels or creating new powers in the process. The latter option opposes one of the claims by intergovernmentalists that states pool power in the EC arena. Matláry (1993) has argued, in a study on European energy policy development, that convergence between Member States and European institutions' interests can be created largely by the EC, and hence new power can be as well.

Away from the theoretical considerations MLG has been applied on various occasions. George (in Bache and Flinders, eds., 2005) believes that MLG has the strength of a theory in it and that it offers a way to explain what sort of an organization the EU is: central executives of state partly do the governing, but in addition share responsibility with other actors, both supranational and sub national. Others have serious reservations about the value of MLG as a theory and refer to the logic sharing of control over activities rather than monopolizing it by national states. Fairbrass and Jordan (in Bache and Flinders, eds., 2005) have identified environmental policy as a ‘case par excellence of the dispersion of authoritative decision-making across multiple territorial levels’. They concluded that the essence lies in the fact that states do not watch passively when sharing control.

Several studies with MLG frameworks focused on climate policy (De Bruijn, 2003; Monni and Raes, 2008) and renewable energy policy (Rabe, 2007; Hirschl, 2009). These studies too are far from unambiguous about how to apply MLG. According to Rabe (2007) climate change as a subject of study is well suited for MLG since national states and classic international relations are not sufficient for this challenge. Whereas MLG was originated to study policy making within the EU, in this effort MLG is applied to the US and Canada both federal and state / provincial governments in order to expose the institutional capacities of (sub) national governments to develop and implement policies that help stabilize or even reduce carbon emissions. One of the assumptions here is that experience in MLG systems proves that an international accord in terms of carbon emission reductions does not automatically lead to these reductions. This analysis demonstrates that tangible results have been booked in particular on the state level in the US, whereas the national government has failed to deliver and that the Canadian case demonstrates exactly the opposite. There is some evidence that supports the notion that government policies from the local to the federal level, including renewable portfolio standards, energy efficiency requirements and car mileage usage, have generated results in the US (Delaquil et al., 2012). In contrast with the suggestion put forward by Rabe, others have argued that unilateral actions are quite useless in this matter (De Bruijn, 2003) and also warned that sub national initiatives are subject to potential free rider issues (Monni and Raes, 2008). De Bruijn argued that these types of policy consist of a continued process of bargaining between levels of governance.

In sum, there is no consensus regarding the usefulness of MLG as a theory. The critique that MLG lacks formal means of decision making raises questions, for within the EU a continued process of shifting of decision-making power between various territorial levels can be observed, as expressed when using MLG as a scheme for analysis. Providing insight into these dynamic and complex processes is one of the major advantages of using MLG as a research tool. Maybe in addition to this policy making process, *implementation* of these policies and realization of them is a display of this process of shifting as well, yet these two processes do not need to be symmetrical. To give an example European Member States have been rather progressive in designing and accepting several guidelines concerning climate change and renewable energy (Trombetta, 2012). MLG provides a useful scheme to analyze this process as well, as is demonstrated by Monni and Raes' study of climate policy initiatives in Finland (2008).

Second, there are several cases in which MLG has been applied as a concept in different research settings, both within and outside the EU. The latter in itself can raise new questions, while the US and Canada, in contrast to the EU, may have different domestic dynamics in terms of decision-making power. Despite these uncertainties, MLG appears to offer an elaborate framework to analyze policy-making processes and decision-making structures in the EU by distinguishing between several territorial levels and in addition providing a difference between public and private actors. Also, there is some experience with the application of MLG in other parts of the world, notably the US. Therefore MLG can contribute to the dissection of the case studies in chapter 4, 5 and 6, in order to search for an answer whether existing decision-making structures in the EU energy system have consequences in terms of European energy security or not.

Discussion

Though it is virtually impossible to review all academic contributions on energy security, the overview presented in the first section of this chapter confirmed the earlier assumption that most contributions to the debate focus on markets (albeit the availability of supplies, supply disruptions and unreliable suppliers) and the concept itself. Less has been written about other vital components of the energy system, i.e. infrastructure and regulation, in particular regarding the internal market. Hence, the analysis confirms the necessity for a broad analysis of the EU energy system, a contribution this study aims to make.

The case studies in the next chapters may provide a good test for the limits to (neo)functionalism as presented in this chapter, in terms of spill-over, how it relates to energy policy in the European Union, and in terms of the other basic principle – form follows function – for example in relation to the oft-quoted collaboration between Russia and the EU. Following Rosamond, there may be signs of certain ‘entrepreneurship’ in European institutions regarding energy resources. Contributions from new institutional economics scholars suggest that the study of functions of government and the distribution of power across levels of government are crucial to understand whether the preconditions to proper market functioning are in place. Given the broad acknowledgement that the US gas system currently is the only well-functioning gas system in the world, it makes sense to use that system as a benchmark in the analysis of the European gas system, and examine whether lessons can be learned. As argued multilevel governance theory may be debated as a theory per se, but it does provide a useful framework for analysis, which in addition has been applied to the US in the past. Therefore these building blocks supplement each other and form a framework of analysis that is used subsequently.

This thesis now first turns to the status quo of EU energy policy, before continuing with the case studies.

3. STATUS QUO IN EUROPEAN UNION ENERGY POLICY

Introduction

Numerous policy makers have contributed to attempts to create a single EU energy policy so far. And it seems no hyperbole to suggest that numerous will follow. As touched upon in the first two chapters of this thesis, most focus of both academic contributions and policy makers has been on developing one single EU energy market (liberalization). The emphasis on unbundling issues and external relations with major suppliers within the triplet of gas directives that has been published so far underlines that statement, as is demonstrated in more detail throughout this chapter. In addition the EC itself stated in one of its considerations regarding Decision 1229/2003/EC that new priorities in energy infrastructure 'stem from the creation of an open and more competitive internal energy market, as a result of the implementation of Directive 96/92/EC.... and of Directive 98/30/EC....concerning common rules for the internal market in natural gas'.[21]

Since the publication of the first Electricity Directive by the EC in 1996, that same EC has shown enthusiasm to develop trans-European energy networks.[22] But where the EC has been relatively effective in creating a more European energy market, infrastructure and also regulation has predominantly remained the domain of the Member States, and trans-boundary infrastructure the domain of private and semi-public market players. Since 2011 renewed steps of the EC on both these elements of the energy system can be identified, and the achievements during the past two decades cannot be entirely ignored. This chapter successively describes the status quo in terms of legislation and actual steps taken so far by the EC and the Member States on the gas market, gas infrastructure and regulatory authorities and discusses these observations and their consequences in terms of decision-making structures. The chapter is based predominantly on primary sources, i.e. existing legislation and regulations, and academic contributions, all for the period up to January 2013.

[21] Directive 1229/2003/EC consideration 2.
[22] Council Decision 96/391/EC laying down a series of measures aimed at creating a more favorable context for the development of trans-European networks in the energy sector.

Markets

Rules and Regulation

Since the early 1990s the gas market has been subject to efforts of the EC to advance the internal energy system, its main arguments notably being 'security of supply and environment protection'. The first directives focused on the facilitation of non-discriminatory transit of natural gas between high-pressure transmission grids and the improvement of the transparency of gas and electricity prices charged to industrial end-users.[23]

Several years later the EC estimated that the time was right to further develop the internal market for natural gas.[24] It had taken its time, given for instance the consideration '...whereas the internal market in natural gas needs to be established gradually, in order to enable the industry to adjust in a flexible and ordered manner to its new environment and in order to take account of the different market structures in the Member States.' The directive laid down common rules for the transmission, distribution, supply and storage of natural gas. Member States were expected to guarantee non-discriminatory openness of their market for undertakings to invest in gas facilities and to make available minimum technical standards regarding storage facilities or distribution and transmission systems. Moreover integrated natural gas companies had to keep separate accounts for gas and non-gas activities, in order to prevent cross-subsidization and distortion of competition.[25] Finally the directive contained elements that strived to arrange third-party access (TPA), gradual market opening within the Member States and reduced market domination of incumbent players.

In 2003 the EC established 'significant shortcomings' in the desired completion of the market and launched the second Gas Directive.[26] One of the important elements was the call for transmission system operators that were part of vertically integrated undertakings to be 'at least independent in terms of legal form, organization and decision making from other activities not relating to transmission.' This implied the EC was taking a clearer stand on so-called unbundling of integrated energy companies, since these constructions allegedly instigated market distortions (in case of cross-subsidization) and at minimum did not bring

[23] See Directive 91/296/EEC and Directive 90/377/EEC respectively.
[24] Directive 98/30/EC. Take note that the first Electricity Directive was published two years earlier.
[25] Directive 98/30/EC, art. 13 sub 3.
[26] Directive 2003/55/EC.

about a higher level of transparency. The new directive also aimed to improve the access of new suppliers to the market and gave consumers the ability to switch freely between gas suppliers.[27] In addition the EC recognized the importance of an active role of consumers for the market to function properly. Hence a number of measures were recorded in the directive to ensure among others transparent contract conditions and dispute settlement mechanisms. Finally the directive prompted Member States to appoint system operators that have responsibility for among others safety, reliability and interconnection facilities and to appoint independent regulators to monitor transparency, discrimination, the level of competition and the tariffs used by system operators. As part of the Second Energy Package a network of European national regulatory authorities was established to safeguard the completion of the internal market, called ERGEG.[28] This collaboration is elaborated on in more detail later in this chapter.

Nonetheless not long after the implementation of the new legislation it appeared that the EC could only conclude that these rules and measures did ‘not provide the necessary framework for achieving the objective of a well-functioning internal market.’ One of the main arguments of the EC to propose new legislation was that contractual congestion of infrastructure still posed serious access and market integration problems, and that effective unbundling of network companies had not been carried out throughout the Community. It stated with regard to the latter that ‘without effective separation....there is a risk of discrimination not only in the operation of the network but also in the incentives for vertically integrated undertakings to invest adequately in their networks.’[29]

Hence the EC launched the so-called Third Energy Package, containing three regulations and two directives, focusing on the amplifying of consumer rights and putting more emphasis on the benefits of the internal market, facilitating cross-border trade, stimulating investments and finally improving the coordination of regulation on the EU level.[30] The two directives in the package mainly focused on broadening consumer rights, for example by requiring Member

[27] Note that from July 2004 industrial clients have had this privilege, whereas domestic consumers were treated equally starting July 2007. This asynchrony gave suppliers the opportunity to adapt to the new circumstances.
[28] Decision 2003/796/EC.
[29] Directive 2009/73/EC, consideration 6.
[30] The relevant legislative documents in the package are Regulation 713 – 715 / 2009 and Directive 72 – 73 / 2009.

States to ensure that consumers can effectively switch between suppliers within three weeks – apart from contractual obligations – and to ensure that consumers have one single point of contact, that provides them with all the information needed to be well informed and actively participate in the market. Directive 73/2009 however also dealt with the meanwhile awkward file of unbundling. It appeared that the EC had suffered too much opposition from in particular Germany and France, since article 9 of the directive offered the possibility of an alternative next to full ownership unbundling, although the latter had always been propagated by that same EC. This directive proposed two alternatives, i.e. the so-called Independent System Operator (ISO) and the 'third way' of an Independent Transmission Operator (ITO). Under ISO Member States had the opportunity to leave transmission networks under the ownership of energy companies, but operation and control of the day-to-day business came into the hands of an independent system operator. In practice an ITO meant that the Transmission System Operator (TSO) remained within the integrated company and the relevant assets of the TSO remained on the balance sheet. The directive did introduce regulatory arrangements in order to guarantee the independence of the ITO from the integrated company. The essential difference rested in the unchanged balance sheet of integrated companies, while transmission systems in general form a substantial part of that balance sheet and integrated companies hence would lose a significant amount of financial impact pressure if full ownership unbundling had been applied.

The three regulations in the Third Package put more emphasis on in particular the infrastructure and regulation part of the EU energy system. The EC for instance established an alliance of gas transmission network companies, called ENTSO-G and ENTSO-E for gas and electricity, respectively.[31] In addition a new European institution to improve the regulatory framework was founded, and called the Agency for the Cooperation of Energy Regulators (ACER).[32] These institutions are elaborated on later in this chapter. Regulation 715/2009 furthermore, again, focused on TPA and transparency requirements.

The Third Package was rapidly followed by Regulation 994/2010. It repealed Directive 2004/67/EC that was seen as the 'first legal framework at Community level to safeguard security of gas supply and to contribute to the proper functioning of the internal market in

[31] Regulation 715/2009, art. 8.
[32] Regulation 713/2009 establishing an Agency for the Cooperation of Energy Regulators.

case of disruptions.' The EC argued that security of gas supply mainly had to be a European concern, i.e. '...cannot be sufficiently achieved by the Member States alone and can therefore, by reason of the scale or effect of the action, be better achieved at the Union level...'[33] The implementation of the regulation had to be monitored by a competent authority that Member States had to appoint before 3rd December 2011.

The EC proposed to closely involve the Gas Coordination Group in the file of security of gas supply and to establish Preventive Action Plans and Emergency Plans.[34] [35] These plans seemed to mainly focus on the infrastructural companies and demanded infrastructure standards, for instance on necessary capacity to satisfy total gas demand, made public before 3rd December 2012. However, in case of emergencies the EC would take a stronger position in terms of coordination. To give an example, the competent authority, had to collect on a daily basis the gas supply and demand forecasts and the flow of gas at all cross-border entry and exit points connecting a production facility, a storage facility or an LNG terminal to the network.[36] Subsequent to these requirements in terms of information, the EC had also decided that in order to assess the status of security of supply at the EU level it needed all relevant information of existing and future inter-governmental agreements with third countries, to be delivered to the EC by the competent authority in aggregated form.[37] It was remarkable that the Member States had adopted in particular this measure in a regulation, notably repealing a directive, since it consequently had direct effect on national legislation. It seemed that the EC actually cut in on the action when security of gas supply was concerned. Examining its considerations that introduce the regulation in combination with considerations from earlier directives on the internal energy market, it seems that the EC had slowly lost its faith that European market forces alone would guarantee security of supply in the EU. In turn the EC had stepped in with specific regulations to safeguard security of supply.

[33] Regulation 994/2010, consideration 49.
[34] As arranged in Directive 2004/67/EC concerning measures to safeguard security of gas supply.
[35] To underline the importance of energy security for the European institutions, see for instance the EP report on the implementation of the European Security Strategy and the Common Security and Defense Policy (2009/2198 (INI)), A7 – 0026/2010.
[36] Regulation 994/2010, art. 13 sub 2.
[37] Regulation 994/2010, art. 13 sub 6 a + b.

Gas Infrastructure

Rules and Regulation

Since 1996 the EC has more actively included infrastructure in its considerations as part of guaranteeing EU energy security. However, whereas the first Gas Directive could be labeled as rather straightforward and having potentially substantial consequences, for instance the earlier mentioned unbundling discussion, the EC for a long time seemed more reticent regarding infrastructure.

Decision 96/391/EC paved the way for the EC to make co-investments in energy infrastructure in order to reduce energy supply costs and thus facilitate economic growth, to stimulate employment and enhance competitiveness, next to the existing financial instruments such as the Structural Funds, the European Investment Fund and support from the European Investment Bank. This financial angle was not entirely new, since Regulation 2236/95/EC already described procedures and conditions for granting Community aid to projects of common interest in the field of trans-European networks in, amongst others, energy infrastructure.[38] The decision also focused on promoting the technical cooperation between Member States in order to enhance the realization of important trans-European infrastructural projects.[39] In addition the EC had also drawn up an overview of projects that deserved priority in this matter, a committee to support it in its work and laid down the commitment to report to the EP, the Council, the Economic and Social Committee and the Committee of the Regions.

These intentions were recorded in the first version of the guidelines for trans-European energy networks, or so-called TEN-E Guidelines (TEN-E).[40] These guidelines have been renewed twice since their first appearance, resulting in the most recent Decision 1364/2006/EC. The TEN-E listed and ranked energy infrastructure projects eligible for Community assistance. The objectives of TEN-E were to contribute to a more effective operation of the EU energy system – for which sufficient interconnection and interoperability are essential – and to guarantee security and diversification of supply (think for example of sufficient interconnection with countries at the frontiers of the EU). In addition TEN-E aimed to strengthen the territorial cohesion within the EU by reducing the isolation of remote regions.

[38] Regulation 2236/95/EC art. 1, following EC Treaty art. 155 sub 1.
[39] Decision 96/391/EC art. 2 sub 1.
[40] Decision 1254/96/EC, later repealed by Decision 1229/2003/EC and then by 1364/2006/EC.

Finally it aimed to promote sustainable development by improving the links between renewable energy production installations and using more efficient technologies.

Projects eligible for Community assistance are ranked in three categories:[41]

- Projects of common interest related to electricity and gas networks in Decision 1364/2006/EC that display potential economic viability. The latter was assessed by means of a cost-benefit analysis in terms of the environment, security of supply and territorial cohesion.
- Priority projects were selected from the category above, but had to have a significant impact on the functioning of the internal market, on the security of supply and / or the use of renewable energy sources. These projects had priority for granting financial assistance.
- Finally projects of European interest were priority projects of either a cross-border nature or which had a significant impact on transmission capacity. They had priority for granting under the TEN-E budget and were given extra attention regarding their funding.

However, in contrast to intentions, in general no large financial support schemes had been used to finance infrastructural projects. The TEN-E budget consists of around € 20 million per year and is mainly used to finance feasibility studies.[42] Rather TEN-E provided a framework that stressed the importance of the proper facilitation and completion of these infrastructural projects by the European Member States, in particular those of European interest. The proceedings were monitored by EU officials and in case of delays or serious difficulties a coordinator could step in to speed up the process.[43] However, the authority of the coordinator did not exceed facilitating the discussion between the institutions involved and reporting to the EC on the proceedings of the relevant project on a yearly basis.

[41] Decision 1364/2006/EC, art. 6 – 8.
[42] Decision 1364/2006/EC, consideration 17. See also Regulation (EC) 680/2007 for the TEN Financial Regulation. Note in addition that the European Investment Bank has played a more important role in financing TEN-E projects.
[43] However, no coordinator can be appointed without agreement of the Member States involved and not after the EP is consulted, Decision 1364/2006/EC art. 10 sub1.

In 2007 the EC reported to both the Council and the EP about the proceedings of the projects as listed under TEN-E adopted in 2006.[44] The communication on the Priority Interconnection Plan (PIP) intended to give an update about the progress of the 42 projects of European interest listed in TEN-E. Supposedly 60% of electricity projects were behind schedule due to complexity and lack of harmonization in planning and authorization procedures. The gas projects received slightly better reports, but special attention was also asked here, in particular for LNG-projects and external interconnections. PIP gave a detailed overview of the relevant policies in this matter, addressing TEN-E, the first legal framework to safeguard security of gas supply – i.e. Directive 2004/67/EC – and reminding the support that the Council had given in 2006 to realize an interconnected, transparent and non-discriminatory internal energy system. The EC then reported insufficient progress, a lack of non-discriminatory network access, and the lack of an equally effective level of regulatory supervision. Furthermore the EU lacked a common regulatory framework to coordinate investments in infrastructure and it also required mechanisms to properly coordinate technical standards, balancing rules and gas quality.[45] Most under-investments are due to insufficient unbundling throughout the Member States, according to the EC. In particular cross-border infrastructure is neglected, leading to the conclusion that 'with infrastructure investment as it currently stands, the EU will not be able to construct a real single market'.

PIP focused specifically on the projects, labeled projects of European interest under TEN-E that experienced significant delays. The analysis showed that the most urgent problems were found in the electricity sector, however 'risks for pipeline investments crossing multiple frontiers are perceived to be growing.' The EC expressed her concern about the lack of a framework for investment by arguing that the 'current market design does not create incentives for efficient transmission investment'. With the budget of TEN-E being rather limited, the EC declared itself in favor of evaluating the current financial framework.

The financial crisis that started in 2007 in the US provided the EC with an excellent tool to actively invest *itself* in key infrastructure throughout the EU.[46] Moreover the gas supply disruption in 2009 had once again underlined the importance to deal with energy security,

[44] COM(2006) 846 final/2, 23.2.3007.
[45] COM(2006) 846 final/2, 23.2.2007.
[46] Note that the EC did need a mandate from the Council to draft its Economic Program for Recovery, which it got in December 2008.

according to the EC in, among others, her Second Strategic Energy Review.[47] Within its European Economic Recovery Plan it reserved € 1.75 billion for 'key strategic interconnections'.[48] However with the financial and economic crisis unfolding, projects that had been planned were delayed or withdrawn. This urged both EP and Council to establish the European Energy Program for Recovery (EEPR) as a financial instrument to boost investment and stimulate the rapid realization of the EU energy and climate policy objectives.[49] The total envelope encompassed close to € 4 billion, of which nearly € 2.4 billion were allocated to a series of targeted gas and electricity infrastructure projects. The EC claimed the allocation of financial means to be successful and expected the EEPR grants to mobilize up to € 22 billion of private sector investment within five years.

Energy policy in the Lisbon Treaty

Following the adoption of the Lisbon Treaty in late 2007, some authors concluded that energy policy had become a shared competence between Member States and the EU (e.g. Trombetta, 2012). Yet it is worth examining what this shared competence entails.

The following articles in the Lisbon Treaty refer to energy and energy policy.

- Article 122 ascribes the EU competences in case of energy supply disruptions (this used to be Article 100 TEC);
- Article 170 allows the EU to contribute to trans-European energy networks (this used to be Article 154 TEC);
- Article 192 gives the EU mandate to set environmental standards, also when the national energy mix is concerned (this used to be Article 175 TEC);
- The newly inserted Article 194 states that EU policy aims to ensure the functioning of the energy market, ensure security of supply, promote energy efficiency and renewable energy, and promote the interconnection of energy networks. However, this 'shall not affect a member state's right to determine the conditions for exploiting its energy resources, its choice between different energy resources, and the general structure of its supply.'

Box 2. EU energy policy in the Lisbon Treaty.[50]

[47] COM(2008) 781 final, 13-11-2008.
[48] IP/09/142, 28 January 2009. The rest of the total budget of € 3.5 billion for energy projects was intended for carbon capture and storage and off shore wind projects.
[49] Regulation (EC) 663/2009.
[50] Consolidated version of the Treaty on the European Union and the Treaty of the Functioning of the European Union, 2010/C, 83/01.

Although perchance desired by the EC, this round of investment turned out to be an incident so far and the structural lack of an infrastructure policy started to show effect. The reports of the EC to the relevant European institutions on the implementation of the trans-European energy networks as laid down in TEN-E underline this statement.[51] The EC in this report evaluated the contributions of TEN-E to its initial goal, i.e. to guarantee security of supply. It concluded that projects labeled 'of European interest' in general had successfully been addressed by the responsible coordinators. It was hardly surprising that the other two lists, regarding priority projects and projects of common interest, had not been dived into as ambitiously, if only for the huge amount of projects selected under TEN-E.[52]

The EC also connected TEN-E to the renewed European goals on energy security and the 20-20-20 targets on sustainability. It concluded that 'the impact of TEN-E has been less relevant in dealing with the more recent challenges concerning the EU's strategic energy policy goals and targets'. Put rather bluntly, the EC concluded that a new approach towards infrastructure was necessary in order to guarantee long-term energy security within the EU. With the support of the Council to thoroughly evaluate TEN-E in November 2010 the EC published its Blueprint for an integrated European energy network.[53] It stated that not only to enable the optimization of the internal market for energy, but also for reasons of security of supply, the integration of renewable energy, the increase of energy efficiency and to enable consumers to benefit from all these attainments, '... a new EU energy infrastructure policy is needed to coordinate and optimize network development on a continental scale...' The EC concluded that the Third Package had laid the basis for a European approach towards infrastructure planning and investment and a more European approach of regulation by relevant national authorities.[54] Hence, the EC was only just laying its hands on other crucial parts of the European energy system, namely infrastructure and regulation.

Direct involvement of the EC in energy infrastructure affairs proved to be a delicate matter. In February 2011 the European Council concluded that streamlining and improving authorization procedures was important 'while respecting national competences and procedures, for the building of new infrastructure'. Later on the document reads that 'the bulk

[51] SEC(2010)505 final, COM(2010)203 final, 4.5.2010.
[52] To illustrate this, the priority projects list contains around 140 electricity projects and 100 gas projects, whereas projects of common interest count around 160 and 120 respectively.
[53] COM(2010) 677/4.
[54] COM (2010) 677/4, paragraph 2.6 page 8.

of the important financing costs for infrastructure investments will have to be delivered by the market, with costs covered through tariffs...However, some projects that would be justified from a security of supply / solidarity perspective, but are unable to attract enough market-based finance, may require some limited public finance...'[55] Implicitly the Council expressed limited enthusiasm for EC involvement in energy infrastructure, but recognized that exceptions could be considered.[56] It therefore asked the EC to draft an overview with more detailed figures on the required investments, suggestions on how to deal with the financing of these projects, and other possible obstacles to realize these investments in energy infrastructure.

So the EC did in June 2011, sketching a rough estimate of energy infrastructure requirements worth € 210 billion for the decade ahead, of which roughly € 70 billion was reserved for gas transmission pipelines, storage, LNG/CNG terminals and reverse flow infrastructure. This figure however may turn out to be higher, while the Ten Year Network Development Plan published by ENTSO-G in March 2011 estimated the figure at € 89 billion and a study commissioned by Roland Berger concludes that investment volumes for natural gas during the period up to 2020 will increase by 30%.[57] These investments are at risk of not being delivered by 2020 due to obstacles related to permit granting and regulation and financing, as announced in the impact assessment accompanying the 2010 infrastructure Blueprint.[58] The EC stated that for certain energy infrastructure projects the current framework was just insufficient, or "...focus of national tariff setting frameworks on national networks and consumers as well as the pressure to keep grid tariffs as low as possible in a context of low acceptability of structurally rising energy prices does not incentivize to invest in these projects..." [59] Characteristics of these projects could be higher regional than national benefits, high technological risks, externalities such as an increase of regional energy security, increased market competition, etc. Approximately € 60 billion of the projects would be subject to these obstacles.

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[55] Conclusions of the European Council (4 February 2011), EUCO 2/1/11 REV 1 published 8 March 2011.
[56] This is based on for instance the position as expressed by then Dutch Minister of Economic Affairs Mr. Verhagen in Parliamentary debates in early 2011.
[57] SEC(2011) 755 final, page 4.
[58] SEC(2010) 1395.
[59] SEC(2011) 755 final, page 6.

To address the obstacles as described the EC on October 19 2011 published its proposal for a Regulation on guidelines for trans-European energy infrastructure.[60] It intends to replace the TEN-E guidelines structure, by recognizing that 'the policy lacks focus, flexibility and a top-down approach to fill identified infrastructure gaps.' The EC concludes that the main identified obstacles, problems related to permit granting, regulation and financing, need to be addressed by formulating projects of common interest that will:

- Get a special permit granting procedure of maximum three years introducing a so-called one-stop-shop in each member state;
- Suggesting an ex ante cross-border cost allocation mechanism and incentives commensurate with the risks incurred by the operator and;
- By making them eligible for EU funding.[61]

Regarding eligibility of EU funding, the EC aims to allocate € 9.1 billion for energy infrastructure out of a total budget of € 50 billion for the period of 2014 – 2020, proposed in the Regulation for a Connecting Europe Facility.[62] As of early 2013 the proposed regulation has not been accepted by the Member States, despite repeated calls of the EC.[63] It is also worth mentioning that even when this allocation of funds for energy infrastructure would eventually be accepted (which may be expected), it would only comprise one seventh of the total budget (estimated at € 70 billion) needed in the period up to 2020 to complete the internal gas market (see e.g. European Commission, 2011).

Coordination and Representation

A part of the new approach towards infrastructure had been the establishment of the European Network of Transmission System Operators for Gas (ENTSO-G).[64] In order to deal with the rather fragmentary nature of infrastructural companies throughout the EU, the EC established this cooperation in order to 'promote the completion and functioning of the internal market in natural gas and cross-border trade and to ensure the optimal management, coordinated cooperation and sound technical evolution of the natural gas transmission network'.[65] ENTSO-G focused in particular on cross-border investments and interoperability. Its tasks are

[60] COM(2011) 658 final, 2011/0300 (COD).
[61] 2011/0300 (COD, page 6 and further.
[62] COM (2011) 665, 2011/0302 (COD).
[63] See for instance COM(2012) 663 final, Making the internal energy market work, page 16.
[64] Regulation (EC) 715/2009
[65] Regulation (EC) 715/2009, art. 4.

here somewhat irreverently described as coordinating (i.e. formulating common network operation tools) and advising (i.e. drafting a non-binding Community-wide ten-year network development plan or formulate recommendations regarding technical cooperation between Community and third countries transmission system operators).[66] It is emphasized in the regulation that the network codes developed by ENTSO-G 'are not intended to replace the necessary national network codes for non-cross border issues.' However one can argue that the establishment of ENTSO-G provides the EC for the first time with a more European view on access to infrastructure and making investments in infrastructure throughout the EU.

An increase in policy initiatives on the Community level was expected to catalyze an increase in representative forces on that level as well. Within the gas infrastructure sector this has happened with the establishment of Gas Infrastructure Europe (GIE), a non-profit representative organization towards all relevant European institutions. Its list of members gives another impression of the fragmented overview of infrastructural companies within the EU: 66 members from 26 countries, gathering transmission system operators, storage system operators and LNG terminal operators. Comparable to ENTSO-G, GIE focuses on the promotion of interoperability and the enhancement of cross-border activity in the EU gas system.

Next to GIE a number of representative organizations participate on the EU level, such as Eurogas (consisting of industry executives and specialists from the Member States), the Technical Association of the European Natural Gas Industry (dealing with technical regulations and standards) and the European Research Group (group of companies with a strong base in R&D).

Regulatory Authorities

Somewhat later than infrastructure, the EC at the end of 2003 established an independent advisory group on electricity and gas, or European Regulators Group for Electricity and Gas (ERGEG).[67] Its main task is to advise and assist the EC with the completion of the internal energy system, in particular when new regulation is concerned. The heads of the national

[66] For a broader description of the tasks of ENTSOG, see Regulation (EC) 715/2009, art. 8, sub3.
[67] Decision 2003/796/EC.

regulatory authorities from the Member States form the members of the organization.[68] Next to consultation and cooperation with the EC, ERGEG also sets out to facilitate these activities among the regulatory bodies in the Member States.

The establishment of ERGEG however does not mark the first cooperation between European energy regulators. From 2000 onward ten regulatory authorities had been working together in order to exchange information and experience, leaving from their common interest: the promotion of the internal energy market. In 2003 this cooperation resulted in the establishment of the Council of European Energy Regulators (CEER). Basically CEER pursues the same goals as ERGEG and the two institutions work closely together. Whereas it seems that CEER is concerned with the preparation of the work of ERGEG, the actual main difference rests in the voluntary organization versus the establishment by law.[69]

From 2003 onward the EC has been evaluating the achievements of the regulatory organizations working together more closely. In 2007 establishing a more solid regulatory framework was recognized as one of the key measures in order to complete the internal energy market, since the existing mechanisms were evaluated as inadequate to harmonize in particular technical standards and hence promote cross-border trade within the Union.[70] One of the options the EC proposed was to set up a new body at Community level to deal with this lacuna. In March 2009 the Council agreed to this option that resulted in the establishment of ACER.[71] Its most distinct tasks are the monitoring of the cooperation of transmission system operators within ENTSO-G (and its brother for electricity ENTSO-E), monitoring the progress of projects that particularly deal with interconnector capacity and providing a framework within which national regulatory authorities can cooperate. In addition ACER received a shared decision-making task regarding terms and conditions for access when cross-border infrastructure is concerned, in case the national regulatory authorities have not reached an agreement within six months or when these authorities request ACER to mediate.[72]

[68] Earlier in 2003, Member States were urged to address one or more competent bodies with the function of regulatory authorities, basically to monitor the implementation of existing and new legislation, as arranged in Directives 2003/54/EC and 2003/55/EC.
[69] CEER is officially a non-profit organization under Belgian law.
[70] COM(2007) 1 final, 10.1.2007.
[71] Regulation (EC) 713/2009.
[72] Regulation (EC) 713/2009, art. 8 sub 1. Terms and conditions for access to cross-border infrastructure include a procedure for capacity allocation, a time frame for allocation, shared congestion revenues and levying of charges on the users of the infrastructure.

Lavrijssen-Heijmans and Hancher (in Arts, Dicke and Hancher, (eds.) 2008) observe that alike ERGEG, ACER still is a hybrid organization, consisting of representatives of national regulatory authorities, and point at problems with political and legal accountability of this type of organizations. Despite the lack of an explicit basis for these organizations to formulate European policy, their activities can have far reaching effects. The lack of formal powers of ACER is confirmed by Coen and Thatcher, who also point at its lack of resources and the absence of the right of initiative (2008). They examine what motivated the EC, national governments and regulatory authorities to create these organizations, and conclude that the main argument lies in problems of coordination, in combination with the inability to agree on establishing a European regulatory authority, making this option 'second best' (Ibid, p.67). Though much can be said about ACER in terms of its limited mandate and financial means, it is worth noting that it is an EU regulatory authority by European law.

Discussion

This chapter has demonstrated the persistent attempts that the EC carried out in order to get a better understanding and possibly firmer hold of the EU gas system as a whole. Zooming in on the different elements of the current energy system it seems that the EC's focus has been on the market since the early 1990s. It can also be deducted from the legislative history that the repeating element in these discussions has been unbundling of integrated energy companies. Combining the desires as expressed by the EC and the factual status of unbundling within the valid legislation, the conclusion seems justified that the EC at this moment has backed down from this particular element of the energy system, for it settled for the compromise of ITO. However, the EC has countered this imperfection in the internal energy market by repealing the existing directive on security of supply and replacing it with a regulation on the same topic. This could mean that the EC has for now accepted that the completion of the internal energy system through complete ownership unbundling of integrated energy companies is not happening in the nearby future.

Moving to infrastructure and regulatory authorities it has been observed that the EC has made proposals for more European coordination and cooperation in this field since the late 1990s. It is also suggested that the proposals until recently were rather reticent and therefore not controversial, in contrast to the unbundling discussion. By now the EC is more on top of these elements of the energy system, due to the still existing problem of contractual congestion and the lagging investments in interconnections and challenges such as integrating expected amounts of sustainable energy into the energy system. In addition the EC has earmarked infrastructure as a key to safeguard security of supply. By now it has become 'bon ton' to state that the disruptions to gas supply in the 2000s could have been countered if the system had functioned better (European Commission, 2010). Finally regulation up to date still is mostly a national affair that is monitored and on occasion coordinated on the European level.

If it is concluded that the EC's attention in terms of the EU energy system has been on the market element for over two decades and its attention has only recently been diversified towards other crucial elements of the energy system as such – namely infrastructure and regulation – then that underlines the asynchrony that was suggested in the introduction of this thesis (and is reflected in the academic debate about energy security as well). Furthermore, this chapter has demonstrated that the process of shaping the EU gas system's basic institutional framework is on-going. It is commonly the case that it is this institutional framework that serves as an incentive structure that creates opportunities for organizations to evolve (see North, 1991, p.109). Therefore, and given earlier observations that without massive discontent a sharp break from existing procedures should not be expected (Williamson, 2000), it seems that the EC has a long and expectedly bumpy road ahead. Or, as Makholm concludes 'the EU is in for some decades of work on the institutions that govern the way its pipelines are regulated, transact with customers, facilitate or impede the growth of a competitive gas market, and promote the security of its gas supplies…' (2012, p.174).

So why have relations between EU institutions and Member States evolved in the way they have? It is an easy question, but unfortunately one without easy answers. The observed initial focus of the EC on the energy markets seems to fit the timeframe of the 1990s and early 2000s, in which liberalization and privatization of markets were fashionable. Other crucial elements of the energy system may have been less appealing to Brussels' civil servants, and it is not unlikely that there was just not enough manpower to do everything at once. It is worth noting that throughout the process hesitance to shift power to the supranational level can be observed, for instance with regard to the unbundling of integrated energy companies or the mandate for EU institutions to structurally finance energy infrastructure. Also, the meager mandate and limited financial means of ACER suggest a compromise rather than a full-fledged choice for a supranational approach. However, the motives behind these examples may be different. Whereas hesitance to unbundle integrated energy companies has been observed in countries with histories of industrial policy (most notably Germany and France), it may perchance be explained as protectionist behavior of national entities. In contrast, more liberally oriented Member States such as Great Britain and the Netherlands were more energetic in implementing this particular legislation and unbundled their integrated energy companies. With regard to the financing of energy infrastructure, Member States have so far stressed that this is a national affair, and in the rare case where European institutions did receive a mandate, it seems to be most important for the Member States, given the politics involved in the allocation process, to get a piece of the pie. As a result of this the available money in those rare instances did not necessarily flow to the places in the EU where it was most needed. An example of this was the allocation of funds from the European Economic Recovery Plan to all Member States, while arguably some parts of the EU energy system were more in need of those funds than others.[73] Finally, with regard to regulation, here too Member States have been reluctant to transfer authority to the supranational level. As for instance Coen and Thatcher (2008) have indicated, ACER and its mandate seem to be a compromise between Member States that are reluctant to transfer power and European institutions that aim to complete the internal energy market and claim to need power to do so. Overall these dynamics suggest a struggle between European institutions and Member States that is not likely to end on short notice.

The next three chapters contain case studies that aim to further explore the question what the described asynchrony can mean for energy security in the EU. It does so by examining existing decision-making structures and using the US gas system as a benchmark. First, chapter 4 analyses the incentives to safeguard investment in gas infrastructure. Then chapter 5 examines the status of shale gas extraction on both sides of the Atlantic Ocean, and subsequently chapter 6 discusses several crucial building blocks of the EU gas system, which according to some scholars (e.g. Ascari, 2011) should aim to trace the example of the US gas system.

[73] For an overview of the projects under the EERP, see http://europa.eu/rapid/press-release_IP-09-142_en.htm.

4. SAFEGUARDING INVESTMENTS IN NATURAL GAS INFRASTRUCTURE[74]

Introduction

The challenge to interconnect and adapt European energy infrastructure is significant and urgent. The EC estimated in June 2011 that the total investments needed in energy infrastructure up to 2020 were roughly € 200 billion. Assuming that natural gas continues to play a crucial role in the EU energy mix, about € 70 billion of that total amount would be needed for investments in gas transmission infrastructure, storage facilities, liquefied natural gas (LNG) terminals and reverse flow capacity. The EC also estimated that these necessary investments would not take place under business-as-usual conditions, because of problems related to permit granting, regulation and financing (European Commission, 2011). With regard to regulation, the EC considered the existing framework to be 'not geared towards delivering European energy infrastructure priorities.' Scholars have analyzed the effects of regulatory uncertainty in Western Europe (that is generally believed to have a reasonably well developed regional gas market) and found that under current tariff policy and with uncertainties regarding demand and supply, it is unlikely that market forces will attract sufficient investments in gas transport capacity (Pelletier and Wortmann, 2009). In view of the desired levels of security of supply and servicing new (sustainable) energy resources, other parts of the continent, most notably Eastern Europe, have significantly less developed gas systems and are currently under construction (see European Commission, 2012; Johnson and Boersma, 2013). On the other side of the Atlantic Ocean, in the US gas system, it has been argued that there are no reasons for concerns about investment in gas infrastructure (Von Hirschhausen, 2008).

As is described in more detail in chapter 6, some scholars have looked at the US gas system in order to draw lessons from it (e.g. Ascari, 2011). It is worth noting that there are some fundamental differences between the two systems, one of them being the lack of institutional history in the EU in terms of energy market liberalization – which is currently in transition

[74] Special thanks go to Professor Machiel Mulder of the Dutch regulatory authority Nederlandse Mededingings Autoriteit (NMa), and Brian S. White and Michael Strzelecki of the United States Federal Energy Regulatory Commission (FERC). I would also like to thank my colleagues of the Transatlantic Academy and those of the German Marshall Fund who have given useful comments and feedback. An earlier version of this chapter was published as a policy paper under the auspices of the German Marshall Fund of the United States.

towards one internal gas system – in contrast to the US, where this process first started in 1938 with the passage of the Natural Gas Act, giving the federal government direct involvement in the regulation of interstate natural gas (for a detailed account of this institutional history, see Makholm, 2012).[75] Nevertheless, the lack of concerns about investments in gas infrastructure in the US asks for further examination, given the significant and urgent challenges that the EU faces. Therefore, despite the myriad of differences between the two gas systems, this chapter aims to investigate them by making an institutional analysis of the EU, using the case of the US as a benchmark. Hence, the main question in this case study is: What lessons can be learned from the investment climate regarding gas transmission infrastructure in the EU and the US, drawing from an institutional analysis? Although there is not a single regulatory approach within the EU, Jamasb et al. (2008) have argued that most Member State regulatory authorities follow the examples set by Great Britain and the Netherlands, and therefore this study focuses on these two cases. The chapter deals mainly with existing decision-making structures in the EU and the US. In terms of regulatory regimes and regulatory instruments, it offers the basic ideas to outline the fundamental differences between the two continents from a regulatory perspective.

This chapter starts with an outline why the European gas system's status quo is suboptimal. Most of the examples used in this paragraph come from the Netherlands. The chapter continues by describing basic characteristics of the US gas system. Both sections provide a brief state-of-the-art overview of relevant academic literature. Subsequently the chapter describes the relation between legislature and regulatory authorities and their mandates in the EU, in the individual Member States and in the US, and discusses these relations. Then, criteria are analyzed that regulatory authorities apply when determining gas transport tariffs. Hereto the broad energy policy goals as laid down in the Lisbon Treaty are used, i.e. security of supply, efficiency and sustainability. These criteria are applied to the US case as well. As the analysis shows, not every regulatory authority uses all of these policy goals. In an attempt to quantify these policy goals, efficiency is examined by looking at what rates of return regulatory authorities allow gas infrastructure operators to make. Quantification of the other policy goals is more challenging. Security of supply can be measured by collecting data on interruptions in gas flows, but those are not always available and interruptions can have

[75] Note that some of the other fundamental differences between the US and EU gas system are discussed in chapter 6.

multiple causes. Sustainability through regulation could be measured in terms of net CO_2 reductions, but studies like that have not been carried out thus far. Next, this chapter focuses on the role of both private and public investments in gas infrastructure and what lessons can be derived from differing existing practices and the on-going academic debate regarding this topic. Finally, decision making structures in both cases are analyzed, using a multilevel governance (MLG) framework.

Both primary and secondary data, covering the period up to January 2013, are used in this paper. The former is primarily qualitative and derived from interviews with representatives of regulatory authorities and infrastructure companies. The latter consists mainly of academic contributions, policy papers and legal documents.[76]

Why the European Union Status Quo Is Suboptimal

First, drawing from the discussion on EU energy security in chapter 2, the academic debate on this particular topic has mostly been focused on limited resources or unreliable external suppliers. The organization and functioning of the EU internal energy system, in particular regarding regulation and energy infrastructure, is on the whole less extensively explored. Research on energy regulation appears to face that same pitfall by focusing mainly on efficiency. As an illustration, Viscusi et al. (2005, p.9) wrote that '...Ideally, the purpose of antitrust and regulation policies is to foster improvements judged in efficiency terms...' However, energy regulation is part of a broader policy area, also including issues such as safety, security of supply and sustainability. The legislature often serves multiple and sometimes changing policy goals, which can go beyond and/or against establishing efficient investment decisions and dealing with antitrust issues. Kwoka and Madjarov (2007, p.26) stated: '....economic theory explains the way to maximize efficiency, whereas other societal objectives could not be achieved by competitive markets...' Furthermore, transmission system operators may be required by law to carry out tasks that are not explicitly part of the regulatory framework. To give an example, European transmission system operators are required by law to make provisions safeguarding security of supply, while at the same time

[76] Most academic literature on regulation focuses on electricity and not on natural gas. According to Kwoka and Madjarov this has to do with special characteristics of electricity and the dynamic that this brings for regulation, e.g. non-storability, low demand elasticity and high capital intensity (2007, p.27).

European regulatory authorities commonly do not, or at least hardly, use security of supply as a criterion when assessing proposed transport tariffs.[77]

Second, there are indications that the current fragmented organization of the EU energy system regarding this matter is not always efficient. An example hereof is the different tariffs and access conditions that infrastructure companies are allowed to introduce for the transport of natural gas in the Netherlands and Germany. In the Netherlands, since 2004 there has been a single gas transmission system operator, named Gas Transport Services (GTS).[78] This is a wholly owned subsidiary of Dutch Gasunie private limited liability company, in turn owned (100%) by the Dutch state but required by law to act independently.[79] In July 2008, GTS purchased two transmission networks in Northern Germany, BEB and EMGTG, respectively from Shell and Exxon Mobil. This extended the network of GTS to Berlin, supposedly providing it with a strategic position regarding the Nord Stream pipeline that runs from Russia through the Baltic Sea to Northern Germany. Shortly after the purchase, in 2009 the German regulatory authority BundesNetz Agentur, tasked with administering and approving the tariffs calculated for the transmission of natural gas, decided to lower the maximum turnover to be achieved by gas infrastructure companies in Germany. As a result, GTS had to devalue 1.52 billion of its initial purchase of 2.15 billion.[80] This resulted in a political debate in the Netherlands regarding the spending of public financial means in risky purchases abroad, and moreover, as anecdotal evidence suggests, the earlier adverse investment has negatively influenced the possible purchase of the adjacent gas network of German multinational company Thyssengas Netz (RWE), which had been put on sale at the end of 2008 under pressure of the EC.[81]

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[77] Gaswet, article 10a, sub 1, part a. Note that indirectly security of supply does play a role in the Dutch case, as the analysis shows later.

[78] In 2005 the integrated gas company Gasunie was unbundled into the commercial company GasTerra and the public transmission system operator GTS. The gas transport facilities that are not part of the national transmission system are administered by regional infrastructure companies. In the Netherlands there are twelve of these companies, namely Cogas, Delta, Enexis, Liander, NRE, Rendo, Stedin, Westland, Haarlemmermeer, Obragas, Intergas and Zebra.

[79] Represented by the Treasury.

[80] See (in Dutch) FIN/2012/969M and the report of American Appraisal (2012) about this purchase by Gasunie.

[81] As announced on the 2nd February 2009. This is supported by an official press release of Dutch Gasunie on March 23rd, that stated it had no interest in Thyssengas ('kein weiteres Interesse') since the German investment climate had become unpredictable through regulatory changes ('Reguliering hat das Investitionsklima in Deutschland 'unberechenbar' gemacht'). By late 2012 research that was carried out on behalf of the Dutch Finance Ministry concluded that Gasunie management made serious

Third, despite steps that have been taken to complete the internal market for natural gas, barriers to competition remain. Gasmi and Oviedo (2010) noted that these are mostly related to market structure, national attitudes towards liberalization, access to gas supplies and access to key infrastructure facilities. Regarding the latter, there appears to be growing consensus amongst European policy makers that the existing regulatory framework is not fit to address the major energy infrastructure needs in the decade ahead. This idea is based on the notion that some infrastructural investment projects are not taking place because they provide higher regional than national benefits (e.g. costs have to be made in one Member State, while benefits are enjoyed by several neighboring Member States), while others do not because they use innovative technologies with higher risks and uncertainties. In addition, there are projects with externalities, i.e. impacts, which are not taken into account by market demand, because they are disregarded in the investment decision (European Commission, 2011).[82] Whereas regulatory authorities currently seem to focus mainly on efficiency when setting tariffs for the transport of natural gas, this is remarkable given the broader policy agenda that looms in the background.[83] It is worth investigating to what extent regulatory authorities consider that wider agenda when designing tariff structures, or taking other regulatory measures, or whether these are otherwise part of the mandate of regulatory authorities under study.

Fourth, relations between the national legislature and regulatory authorities are not always clear. At the request of the EP, the Dutch regulatory authority (and its colleagues in other Member States) was granted the judicial status of an autonomous administrative authority in 2005.[84] The goal of creating this status was to confirm the importance of having an independent regulatory authority in the energy sector and thus depoliticize its work. In 2010, this status caused remarkable friction when the Dutch Trade and Industry Appeals Tribunal (CBb) annulled the tariff regulation that the Dutch transmission system operator GTS had designed in accordance with Dutch government policy. The then Minister of Economic Affairs laid down several conditions that GTS had to apply when designing tariff structures, such as the value of the national infrastructure system, the terms of depreciation and the

errors in the purchasing process and that the company paid too much for the German gas network (American Appraisal, 2012).

[82] See for more details Commission staff working document SEC (2011) 755 final, page 6 and further.

[83] As laid down in for instance the Lisbon Treaty, 2007/C, 306/01, article 176 A.

[84] Report of the EP following the proposed regulation 1/2003 A5-0229/2001, 21st June 2001, page 22. See also Staatsblad 327, 30th June 2005.

remuneration of the cost of capital. However, the Council for the Judiciary stated this was unlawful since the Minister was meddling with the competences of the independent regulatory authority.[85] For that reason, in 2010 the Dutch regulatory authority proposed a new method of regulation for the period starting in 2006.[86] While these tariffs were published and a 'settlement deal' of € 400 million was proposed by the regulatory authority, both GTS and the joint major industrial consumers indicated that they were not satisfied, resulting in a new legal battle that ended in November 2012, in favor of GTS. All in all the process has created considerable uncertainties and setbacks for the infrastructure company and most likely negatively affected the development of new similar business ventures in the Netherlands.[87]

Fifth, in the Netherlands there is an on-going political debate about whether gas networks should be (partly) privatized. GTS's limited financial clout to make necessary investments may have fuelled this debate. The request for unbundling of vertically integrated energy companies, driven by the EC from the late 1980s, has in the Netherlands always been answered for by the argument that networks should in principle be in public hands, since the secure and stable access to energy is an important public concern. Hence, in a liberalized European energy market, the only reasonable thing to do was unbundle the integrated companies. Several years later the unbundled system operator GTS itself appears to be one of the advocates of the privatization of a minority share of the Dutch transmission system, allegedly because it needs additional funds to make the required investments. In addition, in June 2011 a EC staff working paper stated that '...Investors, such as public banks or investment funds, confirmed that transmission system operators have largely exploited their ability to raise debt capital and that future investments will require large equity injections by private investors or the State' (in case of publicly owned transmission system operators).[88] Examples like these demonstrate the need to examine privately funded gas networks, by for

[85] To be more precise, in 2006 CBb ruled that regulatory format and existing legal framework did not fit. The then Minister of Economic Affairs Van der Hoeven issued a new policy rule, amongst other setting concrete parameters regarding GTS's capital expenditures. CBb, however, in 2010 argued that the Minister had impinged on the independent decision making process of the Dutch regulator NMa. See also http://www.nma.nl/en/documents_and_publications/press_releases/news/2011/11_21_nma_makes_draft_method_decisions_gts_available_for_perusal.aspx

[86] LJN: BM9470, 29th June 2010. Comparable verdicts were published on the regulations for electricity TSO and DSO's in that same period.

[87] http://www.nma.nl/en/documents_and_publications/press_releases/news/2011/11_49_nma__dutch_gas_transmission_system_operator_is_to_return_eur_400_million_to_its_customers.aspx and here is a report of the final verdict from November 2012 - http://www.energiekeuze.nl/nieuws.aspx?id=1354

[88] EC staff working document SEC (2011) 755 final, page 5.

instance looking at the US or Great Britain, where private investments in gas networks are common practice.

Natural Gas Infrastructure in the United States

After three decades of regulatory reforms the US natural gas system has moved from a highly regulated to a highly competitive industry.[89] Siliverstovs et al. (2005, p.613) have argued that the European natural gas market is also highly integrated, but that the real issue is that natural gas markets across the Atlantic Ocean are not integrated, leaving gas prices in the US to be determined in a more market driven manner, while European gas prices follow the oil-linked model. Yet other and more recent studies dispute that the European market is integrated and hint at only partial integration, i.e. in Northwestern Europe (Renou-Maissant, 2012; Asche et al., 2013). It makes sense to point at the US/EU difference of literally thousands of producers of natural gas in the US (that one would not find in Europe) seeking a market that brought on the development of a spot market in the nineteen-eighties (Herbert and Kreil, 1996). Others have also attributed part of the contended 'successes' of US liberalization of the gas market to infrastructure institutions and regulation (Medlock, 2012b). De Vany and Walls (1994) argued that before institutionalizing open access to gas pipelines, the necessary regulation basically fragmented the natural gas industry and turned the pipeline grid into islands. Gas would only flow where long-term contracts between gas field and buyer told it to flow. Removing that barrier created dozens of gas spot markets that became highly integrated within two years of open access (Ibid., p. 757). Makholm (in Lévêque, et al. (eds.), 2010) allocated even more importance to the role of pipeline and regulation reforms in the US liberalization of gas markets' acclaimed success, stating that the 'answer to gas security lies in pipelines'. He concluded that more flexible and transparent transport systems, increased flexibility in supply contracts, moving away from oil-indexation and lower costs for network usage should be objectives of European policy makers (Ibid., p.49).

Although scholars have pointed at the benefits of competition in the US natural gas system in terms of more efficient production, they also expressed concerns over increasingly volatile prices due to demand shocks (Mohammadi, 2011). In addition, while there is substantial

[89] For an overview of major regulatory changes, visit http://www.eia.gov/oil_gas/natural_gas/analysis_publications/ngmajorleg/ngmajorleg.html.

agreement that US natural gas markets are largely integrated, empirical evidence suggests that there are considerable differences in the degree of integration of the individual hubs into the national market, indicating at least temporary or short-term market power at four of the nineteen studied trading hubs (Murry and Zu, 2008). This seems to be in line with an analysis by Heather (2012), who predicts a similar scenario (with mature and less developed trading hubs) for Europe. Another distinguishing factor of the US natural gas system is competition in infrastructure. While the details of this feature fall outside the scope of this chapter, it is worth noting that one of its consequences is that in non-densely populated parts of the US people are not connected to natural gas grids, because building a distribution network here would not be economical. In 2011 merely 65 million US 'customers' were connected to gas distribution grids. In parts without gas networks, alternative fuels are applied, e.g. distillate oil, propane or wood. To give an example, in the US currently around 8 million 'customers' use propane as an alternative fuel source.[90]

Nonetheless, the above raises the question whether – with the consideration of the caveats that have been touched upon – lessons can be learned from the case of the US. Moreover, an envisaged shift of policies and regulation towards a more competitive model for the EU gas market is observed, away from long-term and oil-indexed contracts and therefore more in line with the US gas market (see box 3 on the Gas Target Model).

[90] These data are derived from interviews with representatives of the FERC and the American Gas Association. More empirical work into the competitive model of gas infrastructure in the US and its consequences would be helpful.

CEER Vision for a European Gas Target Model

In December 2011, the Council of European Energy Regulators (CEER) published its concluding paper on the Gas Target Model. The paper contains a vision on the future EU gas market and proposes measures to complete the internal gas market by 2014.

In their approach, regulatory authorities think of a competitive EU gas market as a combination of entry-exit zones with virtual hubs. Competition should be based on the development of liquid hubs across Europe where gas trade takes place. Price signals and efficient usage of infrastructure should facilitate gas to flow wherever it is most valued. Hence sufficient and efficient investment in infrastructure should be facilitated.

The status quo is slightly different: historically Europe has met security of gas supply through long-term contracts and facilitating storage of natural gas to provide seasonal and short-term flexibility. Though in the Northwest of Europe wholesale trade on hubs has made progress, see for instance British hub NBP or Dutch TTF, CEER argues there is much work to be done. Some of this has been initiated through ACER, e.g. capacity allocation mechanisms and proposals for harmonized tariffs structures. CEER finishes its paper with three recommendations:

- The 3rd Energy Package in general and entry-exit systems in particular must be implemented as soon as possible. Assessment by the national regulatory agencies should be complete at the end of 2012;
- Capacity allocation mechanisms and congestion management proposals must be adopted and implemented by 1 January 2014 at the latest;
- CEER develops proposals how to identify and integrate new capacity through coordinated market-based procedures.

Box 3. CEER vision for a European Gas Target Model.[91]

Von Hirschhausen (2008) concluded that in the restructured US natural gas system there is little reason for concern about infrastructure investments. In a case study that examined not only gas transmission pipelines but also LNG infrastructure and gas storage facilities, no evidence was found of underinvestment. Rather, on top of the argument regarding US rate of return regulation that it leads to inefficient use of capital and labor, he concluded that this same regulatory framework also secured long-term investment (Ibid., p. 7). Jamasb et al. (2008) found that, taking productivity and convergence as performance indicators, regulation has been rather successful in the US in a data envelopment analysis of US gas transmission

[91] Original document: http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_CONSULT/CLOSED%20PUBLIC%20CONSULTATIONS/GAS/Gas_Target_Model/CD/C11-GWG-82-03_GTM%20vision_Final.pdf – Last retrieved 12 September, 2012.

companies. Subsequently these authors concluded that bench-marking based regulation could be possible if data were available and moreover that in the long run, market integration and competition are alternatives to the European model. At the same time, Von Hirschhausen et al. (2004, p.207) alerted to the risk of changing regulatory regimes while long-term contracts are still in place and the possibility of uncertainty leading to underinvestment. Hence they pleaded for a regulatory framework that balances various objectives, rather than focusing exclusively on the issue of investment in infrastructure.

While many of the aforementioned contributions touched upon the role of institutions in dealing with challenges related to gas infrastructure investment, so far they did not dissect how responsibilities regarding gas infrastructure are divided amongst institutions on both sides of the Atlantic Ocean. Rather, these studies focused on the way gas systems have been organized, and how historical developments, political decisions and regulation have shaped the gas system until the moment of analysis. Despite existing differences between gas systems in the US and the EU and arguably different states of development, current trends towards more competition, as identified in the EU, suggest that an analysis of the organization of these responsibilities may well provide useful insights into the successes and failures of organizing the gas market, and in particular generating an appetite for investments in gas infrastructure. This chapter now turns to the relations between legislatures and regulatory authorities in both the EU and the US.

Relations between Legislatures and Regulatory Authorities

Traditionally independent regulatory authorities were a US phenomenon, which only appeared in the EU in the 1980s and 1990s (Thatcher, 2005). Subsequently a broad range of literature emerged about the reasons for politicians to delegate matters to regulatory authorities, the benefits of doing this and the drawbacks. The often-quoted reasons to create *independent* regulatory authorities are to enhance the credibility of policies and to shift complex technical issues to experts that are outside the political arena (see Elgie, 2006). Thatcher (2002a) also suggested that creating independent regulatory authorities provides an easy route to shift possible blame for unpopular policies away from politicians. Larsen et al. (2006) observed that in the liberalization process of European energy markets, independent regulatory authorities were needed to increase the credibility of the process. This facilitated the need to separate the state as the owner of public utilities since it was also becoming the potential seller of those utilities (Ibid, p.2867). In a survey of sixteen Member States' electricity markets, they found that there appears to be no correlation between the set-up of independent regulatory authorities and their choice of regulatory approach (Larsen et al., 2006). It is worth noting that this national approach of gas regulation is in contrast with the case of the US, where federal authorities have been directly involved in designing regulatory instruments since 1938. Several studies have also mentioned arguments against creating independent regulatory authorities, such as regulatory capture, the lack of accountability of these institutions as well as the lack of democratic legitimacy (Larson et al., 2006; Christensen and Laegreid, 2007; Maggetti, 2009). Thatcher (2002b) indicated that these regulatory authorities have at least broken up what were previously private processes of regulatory decision-making and thus made this process more transparent.

Formal delegation of powers is one thing; another is what this separation between legislatures and regulatory authorities means in practice. Some have argued that regulatory authorities are difficult to control by legislatures because regulatory authorities have access to information that is not available to legislatures and because it is very costly for legislatures to draft new policies to redirect regulation (Viscusi et al., 2005, p. 391). Maggetti (2009) observed that increasingly political power is delegated from democratic institutions to non-representative bodies that lack democratic accountability. He concluded that independent regulatory authorities play a central role in political decision-making and they are also developing to play a key-political role in law-making (Ibid, p.466). This is in line with Thatcher (2005) who concluded that politicians have in fact allowed regulatory authorities to become a distinct set of actors or 'third force'. Szydlo (2012) concluded that national regulatory authorities' economic and social goals often conflict, while at the same time European legislatures have shielded these regulatory authorities. He argued that depriving the Member States' parliaments of the possibility to exert legislative influence on the activities of regulatory activities is dubious because it touches upon essential constitutional principles, e.g. the domain of the law. So, according to him, regulation of issues sensitive to citizens is an exclusive parliamentary prerogative (Ibid., p.795).

The following sections analyze relations between legislatures and national regulatory authorities in the EU and subsequently the US. They also touch upon regulatory mandates in terms of the policy goals efficiency, security of supply and sustainability.

European Union

Within the EU the relation between national legislatures and regulatory authority in the gas industry is based on Directive 2003/55/EC. Member States are summoned to designate one or more competent institutions with the function of regulatory authority that '... shall be wholly independent of the interests of the gas industry...'[92] The driving force behind this clear separation was the EP. Regulatory authorities in the EU are responsible for two activities: monitoring and ensuring non-discrimination, effective competition and the efficient functioning of the market; and fixing or approving, at least the methodologies used to establish the terms and conditions for connection and access to national networks, including transportation tariffs and terms and conditions regarding balancing services.[93] Furthermore, Member States may delegate the task to monitor security of supply to the regulatory authority.[94] Thus, regulatory authorities are considered to be technical units, operating independently from politics.

The third policy goal from the Lisbon Treaty, sustainability, is not mentioned in Directive 2003/55/EC. It is, however, the main subject of Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Both legislature and transmission system operator have clear roles regarding investments in grids and grid codes.[95] Yet the mandate of the regulatory authority in terms of approving transportation tariffs, as described in the previous paragraph, does not apply as strictly here, for '...if significant measures are taken to curtail the renewable energy sources in order to guarantee the security of the national electricity system and security of energy supply, Member States shall ensure that the responsible system operators report to the competent regulatory authority on those measures and indicate which corrective measures they intend to take in order to prevent inappropriate curtailments.'[96] The Member States themselves appear to have a decisive say in the investments needed when it comes to safeguarding sustainability related investments in infrastructure, as for instance indicated in

[92] Directive 2003/55/EC, article 25, sub 1.
[93] Ibid, article 25, sub 2.
[94] Ibid, article 5.
[95] Directive 2009/28/EC, article 16.
[96] Directive 2009/28EC, article 16, sub 2(c).

article 16, sub. 4: ‘Where appropriate, Member States may require transmission system operators and distribution system operators, to bear, in full or in part, the costs referred to in paragraph 3...’

United States

The approach of both legislature and regulatory authorities in the US is more market-oriented than the approach in the EU. This is underlined by the mission that the Department of Energy (DoE) pursues, namely ‘to ensure America’s security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions’.[97] Basically, the US DoE relies on the market to safeguard sufficient energy supplies. The department’s main activities are to gather statistics and fund research on the topics that are mentioned in its mission statement.

The Federal Energy Regulatory Commission (FERC) is the US regulatory authority responsible for interstate gas infrastructure. Comparable to the European case FERC is an independent regulatory agency, and can only be reviewed by federal courts. When focusing on the market for natural gas, the FERC deals mainly with interstate transmission pipelines and spends an estimated 10% of its time on intrastate pipelines (lines taking natural gas from transmission up to distribution level).[98] Similar to the US DoE, the FERC has adopted a laissez-faire approach, resulting in the application of a competitive regulatory model at transmission level (see Vazquez et al., 2012). The method and criteria used to determine transport tariffs and rates of return are examined in more detail in the next paragraph. Overall, a system operator can, together with market entities (e.g. shippers), submit a proposal for a new transmission pipeline at the FERC, which thereafter consults the market and the public about the intended project, controls the proposed rates and whether third party access is safeguarded, and subsequently approves of the project (or not). If, at any stage after construction, tariffs are changed (either due to construction costs, desire by shippers or because of other reasons) the FERC has to approve of these changes. If, however, all parties involved are satisfied with the status quo, the initial tariffs can remain unchanged, unless the FERC starts its own investigation (rate case). The basis for this competitive structure is found

[97] Quoted from website http://energy.gov/mission - Last visited on November 25, 2011.
[98] Note that the FERC has no jurisdiction at the distribution level, following Natural Gas Act article 717, sub b and c. State level regulation may apply to distribution networks, but that does not fall within the scope of this thesis.

in 1992 Order 636 that aimed to '...further the creation of an efficient national wellhead market for gas without adversely affecting the quality and reliability of the service provided by pipelines to their customers.' This regulation, among others, required pipeline operators to unbundle their sales and transportation services, to provide access to storage facilities on an open access contract basis, open access transportation services that are equal in quality for all gas supplies, to offer all shippers equal and timely access to information relevant to the availability of their open access transportation service and to implement a capacity releasing program so that firm shippers can release unwanted capacity to those desiring it.[99]

In sum, while in the EU national regulatory authorities by law have a strong mandate regarding market functioning and setting the groundwork for transportation tariffs, monitoring security of supply and facilitating sustainability are matters that *may* be delegated to the regulatory authority. As is shown in table 2, this in fact happened in the case of Great Britain. In the US, the federal regulatory authority mainly monitors market functioning by a laissez-faire approach and safeguards security of supply by allowing substantially higher rates of return (that are discussed later in this chapter) than its European counterparts, while sustainability is not part of its mandate and considerations.

It is worth considering to what extent the EP's position that regulatory authorities are merely technical units remains valid. The discussion about the different mandates suggests that the approach of regulation is (at least partly) based on political trade-offs. The three policy goals efficiency, security of supply and sustainability inevitably collide at some stage. It seems for example that in the US security of supply prevails as a policy goal, and it can be expected that this has consequences in terms of efficiency (more investments lead to higher costs). Also, EU regulatory authorities that contribute to the establishment of future transportation tariffs inevitably have to deal with trade-offs (e.g. Szydlo, 2012). When for instance considering necessary future investments in infrastructure to facilitate the expansion of the share of natural gas with different caloric values (or 'green gas' for that matter) the regulatory authority has to consider its consequences in terms of efficiency (rising transportation tariffs). Whereas regulatory authorities hence have crucial influence when it comes to generating an appetite for investments in energy infrastructure, and almost inevitably have to make decisions in terms of trade-offs, they are not politically responsible. As the example from the Netherlands earlier in

[99] Docket no. RM91-11-002, et al. Order no. 636-A section II.

this chapter suggested, ex-post control over regulatory decisions can only take place in court. It is worth noting that from this perspective the EU and the US do not substantially differ, however a major difference is found with regard to the level of decision-making. While in the EU regulation is primarily a national affair, in the US regulatory measures regarding interstate gas transmission infrastructure are designed at the federal level. This chapter now turns to an overview of revenues that transmission system operators are allowed to make. More discussion about relations between regulatory authorities and legislatures follows in the final paragraph of this chapter, which deals with decision-making structures in both the EU and the US.

Revenues of Gas Transmission System Operators

Whereas European regulatory authorities apply incentive regulation for the (unbundled) pipeline companies, the FERC promotes competition through unbundling, flexible short-term rate setting, strong property rights and controlling the abuse of market power (Jamasb et al., 2008, p.3399). Rate of return regulation prescribes a reasonable rate of return on investment for companies investing in infrastructure. One of the critiques is that it contains few incentives to operate efficiently (Viscusi et al., 2005, p.436). Incentive regulation in theory is designed to create incentives for the regulated firm to lower costs, innovate, adopt efficient pricing practices and improve quality. However, proper implementation is crucial, for the time path of the price cap must be independent of the firm's actual realized costs, so that efforts by the firm to lower costs do not automatically translate into a lower price (Ibid.). In addition, some have argued that incentive regulation results in lower quality of service. This manifests itself in increased duration of service interruptions, not in increased frequency of interruptions (Ter-Martirosyan and Kwoka, 2010, p. 260). The next sections focus on the forms of regulation applicable to Great Britain, the Netherlands and the US.

European Union

The Office of Gas and Electricity Markets (OFGEM) applies incentive regulation with price caps in Great Britain. The regulatory formula in short leads to an allowed revenue – derived from an estimate of the operating expenditure, capital expenditure, financing costs and taxes for the relevant period, together with the regulatory asset value – for the transmission system operator. For the most recent regulatory period, 2007 – 2012, the allowed rate of return was (to the transmission system operator's satisfaction) 4.4% post taxes.[100] The regulatory asset value is one of the incentives that OFGEM uses to stimulate investments while at the same time reducing operation costs. This is elaborated on in the next section, when analyzing the incentives to generate appetite for investment in gas transmission infrastructure.

Next to safeguarding efficient tariffs, the tasks of OFGEM were recently expanded through new legislation. Starting in 2004, its mandate has also been to contribute to the achievement of sustainable development. This was confirmed in the 2008 Energy Act, which added to the duties of the Gas Markets Authority '...the need to contribute to the achievement of sustainable development...'[101] So how does this materialize on a daily basis? Based on the interviews with OFGEM representatives no examples have been found in the natural gas sector, but in electricity transmission one can think of incentives that were added to regulation in order to diminish the release of sulphur hexafluoride (FS_6) to the atmosphere because of its negative impact on the climate, and because this particular greenhouse gas is not covered under the European emissions trading scheme.[102] Furthermore, the regulatory authority publishes annual policy documents containing a sustainable focus of its activities.[103]

In the Netherlands, incentive regulation with price caps is applied as well. The Dutch NMa carries out an efficiency check, and, based on this assessment, determines the total revenues the transmission system operator can generate in each thee-year period of regulation. The operator then uses these total revenues to propose transport tariffs for usage of its transmission pipelines.[104] The reasonable rate of return in the Netherlands is equal to the so-called Weighted Average Cost of Capital (WACC). The NMa calculates a bandwidth of real WACC values before taxes and subsequently averages the high and low values to determine the WACC. By doing this, the regulatory authority expects that the network operator receives the return it needs to operate efficiently, while at the same time expecting that this return will

[100] See National Grid investor update from 2006: http://www.nationalgrid.com/NR/rdonlyres/0C5D350E-3B87-469B-BD80-73895876C953/13654/NGTPCR4overview15DEC06FINAL.pdf
[101] Energy Act of 2008, part 5, article 83, sub 1c.
[102] For more information, see chapter 11 of http://www.ofgem.gov.uk/Networks/Trans/Archive/TPCR4/ConsultationDecisionsResponses/Documents1/16342-20061201_TPCR%20Final%20Proposals_in_v71%206%20Final.pdf
[103] For the most recent example, see http://www.ofgem.gov.uk/Sustainability/SDR/Documents1/Sustainable%20development%20focus%202011_WEB.pdf
[104] Gaswet, article 12, sub 1.

be representative for the whole period of regulation. Note that the WACC is gradually introduced, by means of a yearly correction of the maximum WACC value or cap (X-factor). Based on yearly performance the NMa applies incentives to stimulate efficient operations (X-factor) and safeguard quality standards that are required by Dutch law (Q-factor). For the current regulatory period (2010 – 2013) the real WACC before taxes is 5.8%, whereas this return was 6.5% in the period from 2006 – 2009.[105] The regulatory authority also advises the government regarding proposed investments by the TSO and plays a role in the design of market mechanisms such as the balancing system.

	Efficiency	**Security of Supply**	**Sustainability**
Great Britain	Delegated regulatory task	Shared responsibility with Department for Energy and Climate Change (DECC), and active engagement with UK government to carry out Gas SCR[106]	Delegated regulatory task for OFGEM since 2008
Netherlands	Delegated regulatory task	Shared responsibility with Ministry of Economic Affairs (though no explicit mandate) for the NMa, that plays role in design of new balancing regime.	No delegated task for the Nma

Table 2. Focus of British and Dutch regulatory authorities, in terms of Lisbon Treaty broad policy goals (green color indicates explicit mandate, red color indicates the opposite, while orange indicates shared responsibility).

105 http://www.nma.nl/images/Bijlage%202%20WACC%20bij%20Methodebesluit%20Transport%20GTS%202010-2013%20(2)22-193277.pdf

106 The Gas Security of Supply Significant Code Review is undertaken by OFGEM with support of the British government in order to determine whether reforms to the current gas balancing arrangements and / or enhanced obligations are required in order to improve security of supply.

United States

In contrast to the EU Member States, the FERC applies rate of return regulation and has thus made a fundamentally different choice than its European counterparts (see Vazquez et al., 2012). As with incentive regulation, transmission system operators know up front what rate of return is allowed by the regulatory authority, but provisional correction mechanisms differ substantially. Whereas EU incentive regulation provides a safeguard for yearly adjustments of tariffs following for instance an X-factor or the regulatory asset value, in the US historically most of the agreed tariffs, once established, were not renegotiated.[107] Littlechild (2012) provides a detailed account of the process of negotiation of settlements through the FERC. He observes a trend towards increased settlement of rate cases by negotiation, instead of costly and time-consuming litigation. Yet, day-to-day regulation has been reported to be 'a complex process of exogenous regulation by FERC, self-regulation between pipeline and shippers, and market processes, e.g. for secondary capacity' (Von Hirschhausen, 2008, p.6).

When judging over a proposed business case, the FERC by law exclusively examines market manipulation and (a flexible variant of) efficiency, as '...all rates and charges made, demanded, or received by any natural-gas company for or in connection with the transportation or sale of natural gas subject to the jurisdiction of the Commission, and all rules and regulations affecting or pertaining to such rates or charges, shall be just and reasonable...'[108] Market manipulation is excluded by demanding third party access and fixing tariffs, when unreasonable or unjust prices are identified at any moment.[109] In November 2011, the standard rate of return that was allowed for new gas transmission pipelines was 14%, in comparison to the estimated WACC of 11.6%, based on data from 1996 to 2003 (Von Hirschhausen, 2008, p.7). This number according to FERC representatives functions as a market incentive, and hence seems to confirm earlier claims that the rate of return in the US is used as an instrument to attract investments in pipeline infrastructure (Joskow, 2005). If operators and /or shippers consult the FERC in order to change the tariffs of an existing pipeline, due to operational costs, complaints of shippers, or other reasons, the regulatory authority can file a rate case and subsequently proposed a rate of return of 11.55% (in 2011). These pipeline rate cases are open to the public. It is worth noting that for the distribution level the rates of return are lower, namely between 8% – 9%. In order to safeguard reasonable

[107] As confirmed in an interview with representatives of the FERC on November 23, 2011.
[108] Natural Gas Act, section 5, article 717C, sub a.
[109] Ibid. Article 717C-1 and article 717D, sub a.

tariffs, FERC staff members advocated positions on behalf of the public interest in pipeline rate cases. In addition, the FERC has recently undertaken proceedings to reduce existing pipeline rates that it believes are no longer just and reasonable.[110]

The legal competences of the FERC focus on security of supply, as shown in table 3. Whereas in the EU other policy goals are agreed upon and, as was shown, regulatory authorities can have them as core competences, in the US these policy goals are not ventilated in US natural gas regulations.[111] In practice this means that the FERC operates in line with its philosophy that new pipeline facilities and expanding interstate pipeline grids increase the overall safety of the industry (allowing for older facilities to be abandoned) and hence enlarge reliability and efficiency.

	Efficiency	**Security of Supply**	**Sustainability**
United States	Delegated regulatory task in the US, though rate-of-return regulation is used as an investment vehicle and may subsequently prohibit most efficient transport tariffs.	Delegated regulatory task for FERC that uses substantial rates of return for pipeline operators to generate appetite for investments.	No delegated task for the FERC

Table 3. Focus of US regulatory authority FERC, in terms of efficiency, security of supply and sustainability.

Regulatory authorities in the EU take a fundamentally different approach towards calculating transport tariffs than their US federal counterparts. Regulatory authorities in both Great Britain and the Netherlands apply forms of incentive regulation and focus on efficient tariffs

[110] Data derived from interviews with FERC representatives in 2011 and 2012.
[111] It is worth noting that the FERC does share strategic goals that resemble the ones defined in the Lisbon Treaty, such as the Strategic Plan 2009 – 2014 states that FERC's mission is to '...assist consumers in obtaining reliable, efficient and sustainable energy services at a reasonable cost through appropriate regulatory and market means... ' – Information derived from FERC's strategic plan, consulted online on November 23rd - http://www.ferc.gov/about/strat-docs/FY-09-14-strat-plan-print.pdf

while sharing tasks and responsibilities regarding security of supply with legislature. On top of that, in Great Britain sustainability has been an explicit legal task of OFGEM since 2008. In the US, the FERC focuses exclusively on helping the market function, by applying rate of return regulation and only occasionally – though increasingly (Littlechild, 2012) – renegotiating tariffs as set between system operators and shippers. The difference between allowed revenues is remarkable, with EU rates of return wobbling around 5% while investors in new transmission pipelines in the United States can count on almost triple that value.[112]

Private and Public Ownership, and Investments

Theory does not provide a unanimous verdict regarding a preference towards public or private ownership of gas transmission companies. Viscusi et al. observed that although some studies report that regulated private electric utilities seem to perform more efficiently than publicly owned utilities, the evidence is not strong (2005, p.508 and further). In a broader analysis of infrastructure quality in deregulated industries, Buehler et al. (2004) concluded that under reasonable demand assumptions, investment incentives turn out to be smaller under vertical separation than under vertical integration. Regarding the gas industry, where liberalization and privatization generally means vertical unbundling or separation, this would be an argument against private ownership. Kwoka argued that '...while often suspected of inferior cost performance, the evidence here shows that publicly owned utilities achieve costs comparable to those under competition. As between those two regimes, public ownership appears more successful in controlling costs by itself, though regulation buttressed by benchmark competition achieves a similar result' (2006, p.146). Jamasb and Pollitt, in a study of electricity markets in Great Britain concluded that '...empirical evidence on the merits of private ownership and privatization in the context of market-oriented infrastructure reforms can be characterized as inconclusive. However, when accompanied by effective regulation, privatization has achieved efficiency improvements...' (2007, p.6164). Von Hirschhausen et al. (2004) nuanced the argument for privatization of infrastructure in terms of overinvestment versus underinvestment. According to them, privatization in the 1980s was largely driven by the lack of public funds for infrastructure investment. In order to avoid underinvestment the responsibility was simply shifted to the private sector (Von Hirschhausen

[112] Regarding distribution infrastructure the rate of return is lower, but still twice as large in the US as compared to the EU.

et al., 2004, p.209). De Joode (2012) in a study of regulation of gas infrastructure expansion concluded that in particular the European case demonstrates that policy makers initially have failed to recognize the potential of competition and private capital in gas infrastructure investment and argued that the regulatory framework should be geared to facilitate such investments in the future.

Cambini and Rondi, in a study on the relationship between investment and regulatory regimes (incentive regulation versus rate of return), found not only that investments are higher under incentive regulation regimes, but also that there is 'no empirical evidence that private ownership boosts investment incentives' (2010, p.4). This is remarkable, since theory suggests that incentive regulation carries the potential risk of underinvestment: reduction of investments leads to higher return and can therefore be tempting. However, analysis has shown that in Dutch electricity and gas networks since 2001, incentive regulation has '...ensured a more rational and professional approach towards investments, with investment levels coming down somewhat at the start of the regulation but picking up later on...' (Haffner et al., 2010, p.35).

While the academic verdict on this topic is out, regulatory authorities are occupied with the question how to generate sufficient appetite for investment, albeit from private or public investors. It seems that the FERC has chosen the path of least resistance, by allowing significantly higher rates of return on gas transmission investments than European regulatory authorities do. In addition, with rate cases only being filed when users or operators bring the case to the regulatory authority's attention or when the regulatory authority itself decides to put a case to the test, investors have a reasonable period of certainty to get their money's worth. This leaves the question open whether the rates of return in the US trigger overinvestment and inefficient use of capital. It is difficult to conclude this based on the available evidence, though the FERC does not rule this out. One study on utilization rates of gas infrastructure concluded that evidence from the US suggests that lower utilization rates should in fact be linked to market development and integration: in a mature market, more gas infrastructure is needed not just to facilitate larger numbers of gas consumed, but also to facilitate an increase in supply flows. Hence utilization rates may well drop, in accordance with US figures (Correljé et al., 2009, p.17). More empirical work, for instance a closer examination of utilization rates of gas infrastructure facilities or end-user tariffs for gas consumption, would be helpful here, but is beyond the scope of this study.

With significantly lower rates of return, the British regulatory authority – like its European colleagues – has been occupied with the question how to attract sufficient appetite for investment. It boasts about its so-called regulatory asset value, which is the value upon which investors earn a return in accordance with the regulatory cost of capital. It is based on the historical investment costs and is set yearly, to complement existing longer term rates of return. In addition to the asset value, OFGEM in 2012 established new rates of return, for a longer regulatory period (2013 – 2021). The main reason for this three-year extension of the regulatory period is to provide more long-term security about the rates of return, i.e. to attract more long-term capital intensive investors. As for the Dutch case, where the legislature is examining whether a minority share of the transmission system operator could be privatized to attract more capital; the aforementioned experiences in Great Britain demonstrate that even when private capital is involved, attracting investment is a complicated regulatory task. It suggests that privatization of gas infrastructure cannot be considered as a panacea. In Great Britain, extending the regulatory period may provide additional stability for investors.

Decision-making Structures, Based on a MLG Analysis

Table 4 and 5 explore what can be learned from decision-making structures regarding gas transmission infrastructure. Hereto a multilevel governance framework is used. It is worth noting, that as multilevel governance theory was designed as a theory of European integration, a valid comparison with the US case requires a shift upward in the scheme, treating the federal level in the US as the supranational level in the EU, the state level in the US as the EU Member State or national level, and so on.

The EU analysis requires several elucidations. First, the red horizontal arrow in table 4 indicates that the clear distinction between the public and the private domain is in fact too rigid. To give an example, the Dutch state owns all the shares of the transmission system operator, Gas Transport Services (GTS), as part of Gasunie. GTS is currently operating in the public domain, i.e. regulated gas transmission activities. Yet the activities of Gasunie are broader, with also investments in gas storage projects and LNG facilities, in this case commercial activities that fit the private domain (a situation that is not unique in Europe, as for instance also the Belgian TSO Fluxys operates an LNG terminal and gas storage facilities in Belgium). In addition, in the Netherlands there is an on-going discussion about the privatization of a minority share of Gasunie, in order to attract additional financial means. In other parts of the EU, such as Great Britain, this privatization of transmission networks has already taken place.[113]

Second, the blue vertical arrow indicates that institutions such as ACER and its advisory body CEER operate on the supranational level. Subsequently, it is worth mentioning, that though these supranational and national organizations in theory are complementary, this is debatable as far as their working in practice is concerned. In principle their interests may conflict, for increased decision-making power on one level of governance automatically implies a decrease of power on another level of governance. Regarding the Member State or national level the independent position of national regulatory authorities is worth mentioning. Note that this situation is comparable to that in the US, where FERC is an independent regulatory agency. Contrary to the illustration from the Netherlands, in the US no legal quarrels that can be linked to this status have been reported, but more research would be useful here. The analysis confirms earlier observations about the relations between legislatures and regulatory authorities. While European gas markets have been liberalized and up-scaled to the EU level, regulation is still a national affair. To speak with Thatcher (2005), on the EU level regulatory agency ACER surely is not a 'distinct actor', contrary to national regulatory authorities. The consequences of the lack of EU regulatory orchestration deserve more empirical attention. Independent regulatory approaches may differ per Member State, and in combination with market players and increasingly also infrastructural companies that operate internationally, it may be expected that this asynchrony can cause friction and does not contribute to the desired completion of the internal gas system.

[113] National Grid plc operates gas transmission and distribution networks in the UK and in Northeastern US. The company was first listed on the London Stock Exchange in 1995.

Governance level	*Public domain*	*Private domain*
Supranational / EU	- Gasunie was the first European TSO to purchase an international network (2008). In December 2012, Belgian TSO Fluxys followed with the purchase of a 32% share in the Algerian / Spanish pipeline Medgaz. - ACER has a limited mandate so far. Replaced ERGEG in 2011 (set up by EC to give advice on internal market).[114] - ENTSO-G (TSO platform) and CEER promote completion of the internal gas market in Brussels but have no decision making power (note that their individual members do, on the national level).	- External investors in energy networks. An example is the role of Mitsubishi in Germany (as an investor in electricity networks).
National / EU *Member States*	- Gas transmission companies, differing per member state - National governments drafting legislation and implementing EC guidelines and regulations - National regulatory authorities safeguarding implementation of guidelines, fair competition in Member States and controlling transmission tariffs with different regulatory systems - Court of Appeal (CBb)	- Gas transmission companies, differing per member state - Investors in transmission pipelines - Shippers - Purchasers of natural gas - Related industries, such as engineering firms, construction companies, compressor manufacturers, IT-companies, banks, etc.

[114] See page 16 and onward: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:129:FULL:EN:PDF – Last retrieved on 12 September, 2012.

Regional	- Joint decision making of regional authorities on environmental issues with regard to new pipelines (in some cases overrule from the national legislature is possible). Also differing per Member State, more research needed.	N/A
Local	- See regional decision making	N/A

Table 4. EU decision-making regarding gas transmission infrastructure[115]

[115] Based on the case of the Netherlands, taking other options in the EU into consideration.

Governance level	*Public domain*	*Private domain*
Federal	FERC - Regulate interstate transmission pipelines - Review of investment proposals (incl. LNG terminals) and determine rate setting methods - Siting / Abandonment of pipelines - Set rules for business practices - Take the lead on environmental reviews under environmental and preservation acts. - Oversee mergers and acquisitions of pipelines, with Department of Justice, Federal Trade Commission, IRS and NRC	- Investors in interstate pipelines - Shippers - Purchasers of natural gas - Related industries, such as engineering firms, construction companies, compressor manufacturers, information technology service companies, banks, accountants and so on
	US Environmental Protection Agency - Assist on federal and state level in determining if environmental aspects of pipeline meet acceptable guidelines	

	Department of Transport's Pipeline and Hazardous Materials Safety Administration, acting through Office of Pipeline Safety - Administers national regulatory program to assure safe transportation of natural gas, petroleum and other materials by pipeline. - Certify safe operations, with jurisdiction over lifetime of pipeline	
	Department of Energy (marginal role)	
State	Regulatory Utility Commissioners (also in National Association, i.e. NARUC) dealing with state regulations, e.g. Pipeline Safety Section	- Investors in intrastate pipelines. Note that gathering lines (from well head to compressor station) are not regulated. - Shippers - Related industries, such as engineering firms, construction companies, compressor manufacturers, information technology service companies, banks, accountants and so on
	Decision-making regarding interstate pipelines takes place on federal level. Intrastate pipelines and distribution networks fall outside the scope of this study.	
Regional and local	N/A	N/A

Table 5. US decision-making regarding gas transmission infrastructure

With regard to decision-making structures in the US, several elements stand out. First, the division of labor is unequivocal, as shown in table 5. There are clear roles for system operators, investors and federal regulatory authority. The legislature has adopted a laissez-faire approach, but can interfere when considered necessary, for instance through the Department of Transport. Decisions regarding interstate gas transmission infrastructure are made in the private sector, within boundaries indicated by organizations at the federal level. One caveat is that other types of infrastructure, in particular intrastate gas pipelines (that can also be gas transmission pipelines), are not part of this analysis. More research would be helpful here.

Discussion

At the beginning of the discussion of this chapter it is worth reiterating some of the fundamental differences between the US and EU gas systems, most notably the substantial difference in institutional history. While the US gas system developed during a decades-long period of regulatory reforms, the EU gas system is arguably in transition and may well have several decades of reforms ahead of it (as argued by Makholm, 2012). Other substantial differences between the EU and US are discussed in detail in chapter 6. Despite these differences, this chapter aimed to analyze whether lessons can be learned from the US system, in particular regarding the generation of an appetite for investments in gas infrastructure, which are indispensable to make the internal EU gas system function.

Several conclusions follow from the analysis of transatlantic regulatory regimes regarding gas infrastructure. First, being a European frontrunner when it comes to liberalizing its energy markets, in Great Britain the regulatory authority explores the boundaries of its mandate, e.g. when it comes to the strict separation between legislature and regulatory authority as required by European institutions. Examples of this are the explicit mandate of OFGEM to contribute to sustainability by means of its regulation or the decision to extend the regulatory period in Great Britain with three more years to provide private investors in infrastructure projects with more long-term stability.

The position of independent regulatory authorities deserves more empirical attention. Though the independence as safeguarded in Europe is comparable to the US, where the FERC acts independently from US legislatures, in Europe currently having independent national regulatory authorities means having 27 potentially different regulatory regimes. In a liberalized EU gas system a more coordinated European approach seems obvious. From an academic point-of-view the observed changes in balance of power are worth further examination. While scholars have focused on the motives of politicians to create independent regulatory authorities and the consequences this has, with the creation of European regulatory agency ACER arguably a new tug-of-war has emerged within the EU gas system, i.e. with regard to the balance of power between this supranational regulatory agency and independent national regulatory authorities. This confirms an earlier analysis of Thatcher (2011) who concludes that formal delegation of mandate to European regulatory agencies has been limited and uneven. Several arguments against the position of these authorities have been described, such as the lack of accountability or the lack of democratic legitimacy (Christensen and Laegreid, 2007; Maggetti, 2009). As this case study showed, fundamental policy goals, i.e. sustainability, security of supply and efficiency, are likely to conflict at some stage. This was confirmed by for instance Szydlo (2012), who even concluded that the position of independent regulatory authorities is in conflict with essential constitutional principles such as the domain of the law.

Second, the lack of underinvestment in gas infrastructure in the US may be attributed to the substantial rates of return that private investors have been allowed to accrue, a mechanism that is assumed to take care of security of supply. In doing so, FERC uses US regulation as an investment vehicle to generate appetite for investment in gas infrastructure. Yet it may well be that users of pipeline infrastructure and consumers in fact collectively pay too much for their gas transport. More research is needed to confirm this. Regardless, the analysis shows that EU regulatory authorities are occupied focusing on efficiency, and less on security of supply and sustainability, whereas in the US security of supply prevails and there are hints that efficiency is less important to its regulatory authority FERC.

Third, it is difficult to link the scope for underinvestment in gas infrastructure in Europe to either private or public capital. While the academic debate provides no final verdict, it is worth noting that the substantial investment levels as reported in the US cannot be linked to private investors per se. It seems plausible that the combination of private capital with rate of return regulation as it is applied in the US generates the level of appetite for investment in gas infrastructure that is currently witnessed. It is worth bearing in mind however, that in the US system gas infrastructure projects that are not economic are simply not being built. Subsequently millions of American consumers are not connected to gas networks and have to apply alternative fuel sources, such as propane and wood. This seems to be fundamentally different from the EU gas system, where European policy makers have applied the principle that every citizen should be connected to the gas grid. The case of Great Britain seems to indicate that attracting private capital in itself is no guaranteed panacea. Despite the fact that is has privatized its gas networks, according to OFGEM representatives the system still struggles to attract sufficient investment. As an example of this, OFGEM has extended the regulatory period with three years to provide potential investors with more long-term stability.

In terms of decision-making structures, the most fundamental difference between the EU and US is that the latter has clear mandates for different stakeholders and decision-makers, while the opposite can be argued about the EU. Diverse institutional history and development is contributing to today's patchwork in Europe, with market players operating internationally and transmission system operators investing both nationally and internationally (an emerging phenomenon, though this is expected to increase). Although interesting from an academic point-of-view, this dynamic institutional development may be somewhat too dynamic for investors, which seek wealth-maximization instead of asymmetric information, ineffective institutions, unpredictable rules and decisions, and unpredictable transaction costs, to speak with North (1991).

Currently the regulatory focus in the EU is at the Member State level, which is not in line with other elements of the EU gas system. Whereas in Europe the traditionally US phenomenon of an independent regulatory authority has been adopted at the Member State level, at the EU level regulatory agency ACER lacks formal decision-making powers and is clearly not a distinct actor like its US counterpart the FERC is. Though it seems that more 'Europe' is needed to streamline EU regulatory regimes, this requires transfer of power from the Member State level to the European level. Up to date national regulatory authorities appear reluctant to do so. Therefore it is worth considering that also substantially better coordination and consensus building between national regulatory authorities could be an improvement to the EU energy system as a whole. Though it may be difficult to imagine with the current patchwork of regulatory regimes in Europe, there are examples of international cooperation in which national authorities coordinate their efforts effectively, e.g. NATO. This illustrates that expanding ACER’s mandate and shifting power to the supranational level is not a *conditio sine qua non* to make the EU energy system function better.

5. SHALE GAS EXTRACTION[116]

Introduction

Encouraged by developments that have taken place since roughly a decade in the US and motivated by a supposed prospect that is labeled ‘energy security’, Polish government officials, business representatives and other specialists have been advocating the extraction of natural gas from shale rock layers under their soil. The Polish are the front-runners in the European shale gas debate. Despite many unanswered questions, the currently preferred technology of shale gas extraction, called hydraulic fracturing (‘fracking’) has been embraced and is expected to end dependence on Russian gas once and for all. Yet unlike the US, it is unclear whether in the EU in fact one single molecule of shale gas is going to be produced.

This case study examines the shale gas extraction potential in the EU, while using the US as a benchmark. It does so by studying available evidence from the US, the only country worldwide where – at the time of writing – extraction of shale gas is full-fledged in process, uncovering a broad range of new challenges and concerns, that are related to market structure and functioning, the environment, infrastructure and regulation. These issues are addressed in the next sections. Furthermore the concept of energy security, which is frequently used in shale gas debates on both sides of the Atlantic Ocean, is discussed. It is worth noting that this part of the chapter may contain some overlap with the first part of the second chapter, in which energy security studies were discussed. The case study ends with an institutional overview of decision-making structures, using a multilevel governance framework. The framework is slightly different from the one that was used in chapter 4. While both in the US and the EU water related decision-making institutions can operate at an interstate level, this category was added to the original framework. When examining the viability of shale gas extraction in the EU the focus is primarily on Poland, since that country is currently most energetically striving for shale gas extraction, while others have either banned available technologies (i.e. France and Bulgaria) or requested more time to evaluate environmental

[116] Earlier versions of this chapter have been written and published together with Professor Corey Johnson of the University of North Carolina, Greensboro, under auspices of the German Marshall Fund of the United States, based in Washington, DC. Special thanks therefore go out to Professor Johnson. In addition I would like to thank my colleagues of the Transatlantic Academy and those of the German Marshall Fund who have provided me with useful comments and feedback and arranged the logistics during fieldwork in Pennsylvania, Brussels and Poland.

concerns (e.g. Germany, Netherlands) or adjust regulatory frameworks (e.g. Czech Republic). Other European Member States will however be touched upon throughout the case study, whenever available evidence requires it.

The data in this chapter have been derived from the available academic literature, policy papers and reports and from interviews with business representatives and policy makers during fieldwork in Pennsylvania, Poland, and Brussels. The data cover the period up to January 2013.

Market Developments

United States

Over the last decade shale gas production in the US has exploded. In 2007 roughly 1.3 trillion cubic feet (approximately 37 bcm) was produced, a number that rose to over 5 tcf (141.5 bcm) in 2010 and projections are that this number will almost triple by 2035 (US Energy Information Administration, 2012a). However, the limitations of these projections have to be considered.

First, there can be new technological or geological insights. It is worth noting that roughly one decade ago most people working on natural gas in industry, government and academia had not heard about shale gas at all. Hence, predicting future developments is exceedingly difficult. To illustrate this, the 2012 Energy Information Administration (EIA) Annual Energy Outlook substantially downgraded the estimates of technically recoverable reserves of shale gas for the US, largely due to a decrease in the estimate for the so-called Marcellus shale, from 410 tcf to 141 tcf (or 11.603 bcm to 4.000 bcm). Blohm et al. (2012) linked this substantial difference to existing reserve estimation techniques, which ignore current land use patterns, regulations and policies and therefore do not accurately represent the accessible reserves. The IEA reported that existing uncertainties about recoverable reserves can be linked to the relatively limited number of available data.[117] It is worth noting that large parts of the Marcellus shale lie in New York, where hydraulic fracturing is banned. Even in Pennsylvania 85% of the wells are drilled in geographically concentrated areas, making estimates about recoverable reserves less

[117] http://www.eia.gov/energy_in_brief/about_shale_gas.cfm

reliable.[118] Also, most of these wells have only been drilled recently, making estimates about long-term production rates uncertain. These factors all contribute to the uncertainties regarding recoverable reserves.

Second, economic conditions of the gas market can change. From July 2008 natural gas wellhead (wholesale price at its point of production) prices have plummeted due to overproduction (US Energy Information Administration, 2012b). This development urged some to suggest the reintroduction of a wellhead price-floor, which was abolished in 1989 with the Wellhead Decontrol Act (Weijermars, 2011). However, it appears that the market itself has corrected the existing mismatch between offer and demand, with for instance British Petroleum reporting a write-off of $2.1 billion on shale gas acreage because of lower natural gas prices.[119] Also, since its peak in late 2008 the number of rigs used for shale gas extraction has been in decline, since low prices forced producers to look for alternative business, e.g. tight oil.[120] Still, IEA forecasts suggest that domestic wellhead prices shall remain below $5 per thousand cubic feet until at least 2023. This in turn is expected to trigger investment in gas-fired electricity plants, leading to an assumed minimal share of 27% of natural gas in electricity generation by 2035 (Paltsev et al., 2011). More broadly speaking, the future of natural gas seems highly uncertain, and depends on a complex set of factors, such as adoption of natural gas for transportation, future climate policies, renewable energy policies or the lack thereof, and geopolitical considerations (Myers Jaffe and O'Sullivan, 2012).

An open question that is relevant to US market development and domestic production is whether or not the US will export substantial amounts of its natural gas in the future. Current predictions are that the country can be a net exporter of natural gas by 2016 (US Energy Information Administration, 2011a). So far one company (Cheniere Energy) has received an unrestricted license, while others have been put on hold. It is worth noting that three other requests to construct LNG facilities and export US-produced natural gas to so-called 'free trade countries' have in fact been approved. Under the Natural Gas Act, the US Department of Energy must approve permit applications to export natural gas to the 15 countries that have

[118] http://www.examiner.com/article/just-six-pennsylvania-counties-account-for-the-majority-of-shale-gas-production

[119] http://www.nytimes.com/2012/08/01/business/energy-environment/01iht-bp01.html?_r=0 – Article accessed on 10 October 2012.

[120] http://mobile.bloomberg.com/news/2013-03-28/u-s-baker-hughes-gas-rig-count-declines-to-near-14-year-low-1-.html

free trade agreements (FTA's) with the US covering natural gas.[121] However, of these countries only Canada, Chile, Dominican Republic and Mexico have existing LNG terminals (Ratner et al., 2011).

Some first studies indeed indicated that exporting LNG can drive up domestic prices for natural gas (US Energy Information Administration, 2012c). Others dispute this conclusion, stating that apparent profitable export options are based on current, but in fact transitory market conditions, that erode due to supply responses abroad (Medlock III, 2012a). In December 2012 the US Department of Energy published a study on the macro-economic effects of exports of natural gas from the US, which outcomes supported loosening existing restrictions on LNG exports (Montgomery et al, 2012). Following this report several US politicians initiated new legislation in January 2013, which would allow for LNG exports to certain countries, for instance NATO members.[122] It is worth noting that the US has been exporting natural gas since at least the 1930s – before that data were not collected – to Canada and Mexico and that these exports have risen with over 10 times since 1999 (Ratner et al., 2011). Although in theory these exports could in the future further increase, this can only be a short-term scenario, since both Canada and Mexico are expected to extract their own shale gas resources at some stage. Except for electricity-fired power plants however, no significant increase in demand for natural gas is expected in the US within the next five years (Ibid, p.17).

While exporting excessively produced natural gas may be an obvious solution – if the political verdict is out – some studies have suggested that in a more integrated global gas market, much of the US shale gas is expected to be too costly to compete in Europe with conventional resources from the Middle East and Russia. In fact, a more integrated global gas market could result in significant US gas imports (Paltsev et al., 2011). Some medium-term forecasts however suggested that a more integrated world gas market can be a long term scenario, for during the last years regional gas prices have been drifting further apart and divergent prices are expected to remain a feature of global gas markets (International Energy Agency, 2012b). Comparable to the future of natural gas in general, the future of LNG

[121] These countries are Australia, Bahrain, Canada, Chile, Dominican Republic, El Salvador, Guatemala, Honduras, Jordan, Mexico, Morocco, Nicaragua, Oman, Peru and Singapore. They are expected to be joined soon by South Korea, Colombia and Panama.

[122] See http://turner.house.gov/news/documentsingle.aspx?DocumentID=319118

exports from the US depends on a complex set of factors, such as longer term shale gas developments outside the US, development of pipelines from Russia and Central Asia to potential US export markets, the effect of exchange rate movements on dollar-denominated supplies, and the extent of liquidity in the market and consequences of moving away from oil-indexation of gas prices (Medlock III, 2012a). Therefore, it remains to be seen whether LNG trade in time leads to a global gas market similar to that for oil, as predicted by Deutsch (2011).

Next to impacts on the US market for natural gas, effects of shale gas extraction on the ground are worth mentioning, for they often are an important argument used by shale gas development proponents. Clearly in states such as Pennsylvania, Texas and Oklahoma, once forgotten towns are blossoming again, in terms of new roads being constructed to facilitate intensive truck usage to accommodate water supply delivery, new hotels being built to house the workforce and increased revenues for local retailers. Yet empirical evidence for these local economic benefits up to now has not been strong. Rabe and Borick (2011) showed that Pennsylvanians have significant doubts about the credibility of the media, environmental groups and scientists on this issue, which follows from a survey of over 500 inhabitants. Overall however these people in majority believe that natural gas drilling has provided more benefits than problems and that this trend will continue in the future. Kelsey et al. (2011) have suggested that the initial assessments about economic benefits of shale gas extraction were too optimistic, indicating that not only were the benefits lower than expected, but also that only half of the revenues stays in the hands of the locals. Up to now in fact job creation has been modest compared to earlier estimates, and roughly 40% of the workforce has been reported to be non-resident (Ibid). This is not surprising given the highly specialized knowledge that is required, in particular in early phases of shale gas exploration and extraction. Empirical evidence from Colorado, Texas and Wyoming suggested that earlier predictions about job creation may have been too large and that large increases in value of gas production caused modest increases in employment, wage and salary income, and median household income (Weber, 2012).

European Union

Up to now, it seems that the effects of US shale gas production on European markets are exclusively indirect and there are currently no signs that this will change in the nearby future.

LNG from Qatar, other parts of the Middle East and also Eastern Siberia intended for terminals in North America is now finding its way to European and, predominantly, Asian markets (as described in more detail in chapter 6). Furthermore the increased usage of gas-fired power plants in the US due to record low gas prices has made coal cheap and available, resulting in an incline of coal-fired electricity generation in Europe (Rühl, 2012). LNG is changing the dynamics of global gas markets and European gas prices on spot markets have been significantly lower than oil-indexed gas during recent years. It is therefore expected that the EU continues to move slowly away from oil-indexation (Pearson et al., 2012).

Currently it is too early to tell whether domestic European shale gas production takes off and if it does, whether this gas can compete with cheap Russian, Norwegian, Algerian or Dutch gas that is abundantly available on the market. Future increases in LNG imports may further influence this scenario. A reconstruction of why the shale gas boom happened in the US shows that the interplay of favorable geological conditions, access to and availability of infrastructure, substantial public support, availability of service industries, broad political support, a large consumer market and a favorable fiscal climate created a unique momentum that is unlikely to be copied on the European continent (Boersma and Johnson, in Musialski et al. (eds.), 2013).

Significant shale gas resources have been reported in the EU (Leteurtrois et al., 2011; Polish Geological Institute, 2012; US Energy Information Administration, 2011). Yet given the absence of experience with shale gas extraction in most parts of the world and given the number of affiliated uncertainties, reserve estimates should be treated with ‘considerable caution’ (Pearson et al., 2012). Contrast to the US, actual shale gas extraction is still in the embryonic phase. A replication of the US shale gas revolution has been questioned, with reference to less favorable geological conditions, the absence of tax breaks, lack of a well-developed onshore service industry and the possible lack of public support due to the absence of local financial benefits (Stevens, 2010). The Joint Research Center predicted that in the long run the best case shale gas production scenario for the EU is replacement of declining conventional production and having import dependence not exceed 60% (Pearson et al., 2012).

In Poland, several handfuls of wells have been drilled.[123] Companies are currently examining cores to establish the quality of gas and calculate at what costs it can eventually be extracted. So far the results have been mixed, with Exxon Mobil ending its exploratory operations in Poland in June 2012 after two disappointing wells being drilled.[124] Countries like Germany and the Netherlands are awaiting further research, particularly on environmental concerns that have been linked to shale gas extraction, while France and Bulgaria have put outright bans on hydraulic fracturing, the currently preferred technology to extract natural gas from shale rock layers. According to French officials hydraulic fracturing brings too many uncertainties and moreover local benefits are too meager (Leteurtrois et al., 2011). Bulgarian authorities in January 2012 were even so enthusiastic to put a ban on shale gas extraction that they made low-pressure hydraulic fracturing for conventional drilling impossible in the process, an unintended consequence that was abolished in June 2012.[125] Czech Republic officials argued in the fall of 2012 that their current regulatory framework is not geared to safeguard shale gas extraction in an environmentally viable fashion and are therefore considering a ban on shale gas explorations until June 2014.[126]

Environmental Concerns

This section provides an overview of the most prominent environmental concerns that have been linked to shale gas extraction and hydraulic fracturing.

Carbon Footprint and Fugitive Methane

Gas that is released during the production process (‘fugitive methane’) can have implications for the atmosphere and groundwater. This section focuses on potential climate impacts of methane emissions and fuel switching to natural gas, whereas the subsequent section will discuss potential ramifications of methane as a groundwater pollutant.

Fugitive methane represents the gas that is leaked during the entire life cycle, i.e. from extraction to burning. As a greenhouse gas, methane is roughly 20 more potent than CO_2 but it has a much shorter life cycle in the atmosphere (Alvarez et al., 2012). Methane emissions

[123] In January 2013 according to the Economics Ministry in Warsaw around 40 wells had been drilled.
[124] http://www.naturalgaseurope.com/exxonmobil-leaves-poland-shale-gas
[125] http://www.reuters.com/article/2012/06/14/bulgaria-shale-idUSL5E8HEAL720120614
[126] http://www.naturalgaseurope.com/czech-republic-plans-shale-gas-moratorium

from natural gas production have increased by 25.8 teragrams of CO_2 equivalent, or 13.6%, since 1990 (US Environmental Protection Agency, 2012a). Of the fugitive methane emissions 58% occur during field production (e.g. leakage from the wells, gathering pipelines or gas treatment facilities). In short, during the production of both conventional and unconventional natural gas methane leakages occur, and most of the academic debate focuses on the question how large these emissions are as a percentage of overall production.

Some studies have suggested that shale gas wells have substantially higher fugitive methane emission rates (between 3.6% and 7.9%) than conventional gas wells (between 1.7 %and 6.0%) (Howarth et al., 2011). Other academics have questioned the data used in that paper (Cathles et al., 2011). Some have argued that technical fixes are available to substantially reduce the amount of fugitive methane (Wang et al., 2011; Jenner and Lamadrid, 2013). Yet others have indicated that these fixes focus primarily on preproduction emissions, while life cycle estimates are mostly dominated by the combustion emissions of the gas (Jiang et al., 2011). Based on a nearly 4,000 shale gas well sample from 2010, O'Sullivan and Paltsev (2012) concluded that hydraulic fracturing operations have not substantially altered greenhouse gas emissions from the natural gas sector. According to their estimates based on 'current field practice' 70% of potential fugitive emissions are captured using green completion technologies, while 15% of those potential emissions are vented and 15% is flared.

Thus, uncertainties remain in this debate, whether shale gas is potentially a viable bridging fuel to a low carbon economy and what can in fact be done about methane emissions during the life cycle. These uncertainties led Stephenson et al. (2012) to the conclusion that the frequently used terminology of natural gas being an ideal 'transition fuel' to a low carbon economy should be abandoned. Myhrvold and Caldeira (2012) have concluded that large scale usage of natural gas is not the way forward in the transition to low-carbon electricity, and have suggested a combination of conservation, wind, solar, nuclear energy and possible carbon capture and storage instead. Ironically, some observers have noted that carbon sequestration sites could be restricted due to large-scale shale gas extraction from shale rock layers. In short, shale gas extraction involves the fracturing of shale rock layers in order to increase its permeability to let the natural gas flow up into the well and as such hydraulic fracturing is in conflict with using these rock formations as a barrier to CO_2 migration (Elliot and Celia, 2012).

Contamination of Ground Water and Surface Water

State regulators appear to be struggling to ascertain causal relations between drinking water contamination and shale gas extraction operations. So far, two cases of contaminated drinking water were reported that were likely to be directly linked to shale gas extraction. The first is in Pavillion, Wyoming, where the Environmental Protection Agency (EPA) started investigating private water wells after complaints of locals. After investigating sample water, EPA found that ground water contained compounds likely associated with natural gas production. The draft report was published in December 2011 (US Environmental Protection Agency, 2011a). The second case stems from Dimock, Pennsylvania, where in November 2011 EPA announced that in four investigated home wells inorganic hazardous substances were found that present a public health concern. The following memorandum, which was published in January 2012, reported the presence of Barium, DEHP, Glycol compounds, Manganese, Arsenic, Phenol and Sodium, all known to be used in hydraulic fracturing processes (US Environmental Protection Agency, 2012b). On the request of US Congress the EPA has also been working on a broad study on the impacts of hydraulic fracturing on drinking water quality, of which final results are not expected before 2014 (US Environmental Protection Agency, 2011b). Meanwhile, what has widely become known as the "Halliburton loophole" continues to ensure that comprehensive federal regulation of hydraulic fracturing as it relates to potential groundwater contamination remains elusive. In short, an insertion in the Energy Policy Act of 2005 amended the Safe Drinking Water Act to exempt hydraulic fracturing as a technology from the so-called Underground Injection Control (UIC) program, except when diesel fuel was used in the process (US Government Accountability Office, 2012).[127] Generally, EPA uses this UIC program to regulate the injection of fluids underground, but the exemption made it impossible for EPA to regulate potential groundwater contamination caused by fracking.

Next to fluids used in hydraulic fracturing, natural gas itself can contaminate ground water. A study on the Marcellus and Utica shale rock formations in Pennsylvania concluded that there was systematic evidence for methane contamination of shallow drinking water systems in at

[127] See also http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydroreg.cfm

least three areas where hydraulic fracturing occurred as well. In 85% of the wells under study methane concentrations were reported, but they were substantially higher when closer to natural gas wells. The same study found no evidence for contamination of ground water with fluids used in hydraulic fracturing (Osborn et al., 2011). In January 2013 the US Geological Survey published a study examining the water quality of shallow domestic water wells in Northern Arkansas, focusing on chloride and methane concentrations, in which no evidence was found of groundwater contamination linked to the gas industry (Kresse et al., 2012). Therefore, with no clear empirical outcome at this stage it has been difficult to make general statements about relations between shale gas extraction and drinking water quality.

Induced Seismic Activity

During 2011, the Youngstown, Ohio area experienced twelve seismic events ranging from 2.1 to 4.0 magnitude on Richter scale, according to a study by the Ohio Department of Natural Resources (2012). Each of these events occurred into a mile radius of a so-called class II deep injection well, being the type of well that oil and gas producers use to dispose injection fluids. While disposal wells are not the same at hydraulically fractured gas wells, the increase in deep water injection wells during the last years in Ohio is directly linked to the industry’s need to dispose flow-back fluids from shale gas operations in Ohio and neighboring Pennsylvania, where this practice has been prohibited since May 2011 (Ibid.). The conclusion of the report is that it is probable that the earth tremors were induced (in this context meaning that the tremors are the result of human activity).

From January 2011 onward the Oklahoma Geological Survey registered 50 small tremors from 1.0 to 2.8 magnitude nearby shale gas extraction operations, but was unable to say ‘with a high degree of certainty’ that these were induced (Holland, 2011). Another study linked seismic activity in North central Arkansas to waste fluid injection from hydraulic fracturing operations (Horton, 2012). The US Geological Survey published a study that documents a seven fold increase in seismic activity in central US since 2008, largely associating this increase in seismic activity to the large increase in the number of waste water disposal well injections (Ellsworth et al., 2012). In June 2012 however, the National Research Council pre published its results of an examination of scale, scope and consequences of induced seismicity during fluid injection and withdrawal activities related to amongst others shale gas extraction. The authors concluded that the process of hydraulic fracturing does not pose a high risk for induced seismicity (National Research Council, 2012, p.156). In addition injection of waste water derived from energy technologies such as hydraulic fracturing does pose some risk for induced seismicity, but 'very few events have been documented over the past several decades relative to the large number of disposal wells in operation' (National Research Council, 2012).

In December 2012, in the United Kingdom the shale gas industry received the green light to resume operations after research had been concluded into two seismic events near Blackpool in 2011 with 2.3 and 1.5 magnitude. In June 2012 the Royal Society and the Royal Academy of Engineering published their review of scientific and engineering evidence regarding risks associated with hydraulic fracturing. It concluded that 'seismic risks are low' and leaves the carbon footprint of shale gas as the only contentious issue related to shale gas extraction on the table for further research (The Royal Society and The Royal Academy of Engineering, 2012). Though geologists determined it was highly probable that the seismic events in Blackpool were induced operations were allowed to be resumed with the proviso that a traffic light system be implemented to govern operations. Under the new British regulations, as of December 2012, operators seeking to explore shale gas through hydraulic fracturing have to do substantial research prior to operations regarding seismic risks, submit a plan how these risks are addressed and carry out seismic monitoring before, during and after operations. Also, a 'traffic light system' is required to monitor unusual seismic activity.[128] Earlier reports suggested that this system would require companies to halt operations when new seismic activity would exceed 0.5 magnitude, but more research is needed to study the new British regulations and their impact on shale gas operations and industry's appetite for it.[129]

Arguably a number of industrial activities has been linked to induced seismicity, including reservoir impoundment, mining, construction, waste disposal, and perhaps most prominently in recent years, fluid injections for geothermal energy exploitation (Majer et al., 2007). Up to date the US Department of Energy states that most of the induced seismic activity qualifies as an 'annoyance', not a risk, and argues that proper engineering can minimize the chances of seismic activity. Yet so far it is unclear where the threshold between acceptable nuisance and unacceptable risk is. In addition it is unclear whether and if so what from a regulatory

[128] For the official announcement, see http://www.decc.gov.uk/en/content/cms/meeting_energy/oil_gas/shale_gas/shale_gas.aspx
[129] http://www.guardian.co.uk/environment/2012/apr/17/gas-fracking-gets-green-light

perspective can be done to minimize the risk, for an earthquake of magnitude around 4.0 and up (that have repeatedly been reported in central US) seems like a nuisance one would want to avoid in more densely populated areas. Perchance the newly launched British regulatory model could be used elsewhere, though with controversy surrounding the topic in the US is seems unlikely that happens any time soon.

Water Availability and Recycling

Water issues linked to shale gas extraction also involve the availability of the resource. The EPA estimates that the water quantity needed to fracture a horizontal well can go up to 5 million gallons, depending on depth, horizontal distance and the number of repeated operations (US Environmental Protection Agency, 2010). In areas where water is abundant, such as Pennsylvania, this is not an issue. However in drought-prone regions, such as Texas, water availability can be an issue of concern. In July 2011, the Texas Water Development Board estimated that the shale gas industry used about 12 billion gallons of water per year in Texas, a number that was expected to grow up to 40 billion gallons per year in 2030 (Nicot et al., 2011). A study focusing on the three major shale gas plays in Texas to quantify the net water usage for shale gas production, found that roughly 10% of annual water use in Dallas is destined for the shale gas industry. For the whole state of Texas, water usage for shale gas is under 1% of total withdrawal, however local impacts vary with the availability of water and competing demands (Nicot and Scanlon, 2012). Some authors suggested that the debate on water availability in places such as Dallas/Fort Worth, Texas, despite the significant concern amongst local citizens, diverts attentions from the primary factor affecting water supply in expanding urban areas: increasing municipal water use (Fry et al., 2012).

Another environmental concern linked to shale gas and water is what to do with wastewater, once it has been injected into the well together with sand and chemicals. The most quoted options are reinjection in the well (that has been linked to induced seismic activity), discharge to surface water after treatment or application to land surfaces. Data from 2011 from the Pennsylvania Department of Environmental Protection suggest that about half the wastewater was treated; about one third was recycled to be used in other hydraulic fracturing operations, while less than one tenth was injected into disposal wells (Hammer and VanBriesen, 2012). Wastewater handling has been reported as a key problem for environmental opposition in several cases (Rahm, 2011). Some studies have suggested that federal and state regulations have not kept pace with the shale gas industry and should be strengthened to reduce risks of hydraulic fracturing for current regulatory frameworks are ‘inadequate’ to do so (Hammer and VanBriesen, 2012). Alternative fracturing fluids and the use of non-fresh water are part of on-going research activities (Pearson et al., 2012). In Canada, over 1.200 successful simulations have taken place of what is called Dry Frac, a process that uses liquid CO_2 as the carrier fluid in fracturing operations without using water or any additional treatment additives. One challenge to overcome is the formation of ice in drilled wells, which can be done using N_2 gas (nitrogen). One key challenge remaining for these inexpensive fracturing fluids to become serious commercial alternatives is the lack of infrastructure to transport N_2 and CO_2 (Kargbo et al., 2010).

Regulation

Following these environmental concerns an obvious question is if, and if so, how these issues can be addressed to avoid environmental disruptions or worse. Here, the US and the EU seem to differ fundamentally. That difference appears to originate from what is called the precautionary principle, as laid down in the EU Lisbon Treaty (European Union, 2010a). In short, it aims to ensure a higher level of environmental protection through preventive decision-taking in case of risk. It is used, in particular, where scientific data do not permit a complete evaluation of the risk and can then be used to stop or withdraw products or services considered to be potentially hazardous. The absence of this principle in US law arguably contributed to the situation in which industry has taken the lead regarding hydraulic fracturing and shale gas extraction, while legislature and regulatory authorities on both federal and state levels have been occupied keeping pace, as has been demonstrated by several examples of environmental concerns in the previous sections.

United States

Overall the primary regulatory authority for shale gas is at the state level. The lack of federal regulations in most issues related to shale gas extraction has resulted in a wide variety of approaches towards current practices in the country, varying from warm embracement of technology and further exploitation of natural gas (e.g. Texas) along reluctance (e.g. New York State) to outright bans (Vermont, as of May 2012). Efforts to regulate some of the environmental concerns have mostly occurred on the state level and have in few instances even encountered outright hostility, such as in Texas (Rahm, 2011).

The disclosure of chemical constituents used in hydraulic fracturing fluids is still largely not required under federal and most state laws (Jackson et al., 2011). Today some developments can be identified. While industry representatives first claimed this information to be proprietary, an increasing number of states have installed regulations that force gas companies to disclose either what chemicals are used or what quantities of chemicals are used. Yet most of these regulations contain trade secret exemptions. The first exception is proposed regulation in Alaska, where the Oil and Gas Conservation Committee proposed rules without these exemptions. It remains to be seen whether these proposals make it into law.[130] Again, significant differences between states have been reported, in some cases linked to states being 'energy dominant' such as Texas or not, in this analysis Colorado (Davis, 2012). Attempts to regulate disclosure of chemicals on the federal level, for example in the form of the so-called FRAC-Act that was introduced to the US House and Senate in June 2009, have so far failed.[131] In May 2012 the US Department of the Interior published proposed rules for gas companies working on public and Indian lands that require the disclosure of chemicals used in hydraulic fracturing operations, yet only after operations have been completed (US Department of the Interior, 2012).

Water quality protection on the federal level is arranged under the Safe Drinking Water Act, which prohibits the underground injection of fluids from endangering drinking water. However, hydraulic fracturing operations have been excluded from these regulations under a 2005 provision amending the Safe Drinking Water Act, the only exception being hydraulic fracturing operations involving the usage of diesel.[132] The federal EPA is investigating the impacts of hydraulic fracturing on drinking water, by examining the effects of large volume extraction of water, chemical mixing, well injection, flow-back and produced water, and waste water treatment and water disposal (US Environmental Protection Agency, 2012d). While the progress report in late 2012 did not contain conclusions, final results are not expected before 2014. Existing attempts to regulate water quality on the federal level comprises the Fracturing Responsibility and Awareness of Chemicals Act, yet passage

[130] http://www.eenews.net/public/energywire/2013/01/03/1 - Retrieved 16 January, 2013
[131] Fracturing Responsibility and Awareness of Chemicals Act. S. 1215 and H.R. 2766. 9 June 2009.
[132] This provision is widely known as the earlier mentioned Halliburton loophole.

appears unlikely in the nearby future, according to some because the EPA study results shall be awaited (Jackson et al., 2011).

The treatment, disposal and reuse of wastewater is subject to several regulations, though not adequately protective according to some (Hammer and VanBriesen, 2012). Note that discharge of wastewater into surface water without treatment is not allowed. However, as a consequence of its exception from the Safe Drinking Water Act, if wastewater is treated for the sole purpose of reuse in hydraulic fracturing operations, it is not subject to federal regulation. On the state level there is authority to regulate these issues, as occurs in some cases.

One area in which federal regulation has been adopted is air quality. In April 2012 the federal EPA used its authority under the Clean Air Act to regulate emissions from drilling activity. From 2015 onward gas producers have to abide to federal rules for natural gas wells that are hydraulically fractured, demanding these companies to apply what have been called Reduced Emissions Completions, e.g. the application of capture technology to avoid damaging gases, such as volatile organic compounds or methane to come into the air. Until 2015 companies are required to flare these emissions, while venting is prohibited (US Environmental Protection Agency, 2012c). Further research is needed to identify what share of the wells in the US in fact fall under these regulations, for several exemptions apply. It is also worth noting that seven states (New York, Maryland, Delaware, Vermont, Connecticut, Rhode Island and Massachusetts) announced in late December 2012 that they would sue the federal EPA, seeking to force the agency to regulate methane emissions from natural gas operations. According to the states the mentioned air quality regulations are not sufficient to address methane emissions from shale gas operations and stricter regulations are needed here.[133]

European Union

Despite the fact that not a single molecule of shale gas has been produced in EU, federal regulatory development is significant, notably partly based on US experiences with regard to environmental issues (European Parliament, 2011). In early 2012 the EC published a commissioned report on the existing legislative framework in the EU, which examined four of its Member States, i.e. Germany, Sweden, France and Poland (Philippe & Partners law firm,

[133] http://www.sustainablebusiness.com/index.cfm/go/news.display/id/24384

2011). The authors concluded that the regulatory framework was sufficient for the early exploratory phase shale gas extraction in the EU is in, but it can be debated whether that is the relevant question. The report does not assess whether all existing legislation has been transposed into national law. Furthermore it seemed relevant to know whether moving beyond the exploratory phase of extraction is possible within the existing regulatory framework.

In September 2012 the EC published three sizeable reports about the impacts of shale gas on markets, environment and climate (AEA, 2012a; AEA, 2012b; Pearson et al., 2012). The report on the environmental impacts of shale gas extraction concluded that shale gas extraction generally imposes a larger environmental footprint than conventional gas extraction (AEA, 2012a). It identified environmental pressures in terms of land-take, releases to air, noise pollution, surface and groundwater contamination, water resources, biodiversity impacts, traffic, visual impact and seismicity. Currently 19 pieces of EU legislation are relevant to all or some of the stages of shale gas extraction.[134] The report also listed a number of gaps in existing legislation and some potential gaps, most notably that Environmental Impact Assessments are not required and that there may be potential gaps regarding waste management, emissions to air, water contamination, water use and noise.

The study on climate impacts of shale gas extraction suggested that greenhouse gas emissions linked to electricity produced by burning shale gas are 2% to 10% lower than emissions from electricity generated from sources of conventional pipeline gas located outside of Europe, and 7% to 10% lower than that of electricity generated from LNG (AEA, 2012b). However, these results evaporate when emissions from shale gas during the entire extraction phase are not effectively controlled (‘venting’). Questions remain as to what existing framework would be appropriate to regulate emissions from shale gas extraction. The authors name the Environmental Impact Directive, the Directive on Industrial Emissions and the European Emissions Trading Scheme as possible vehicles.

Even regulations adopted by European institutions provide no safeguard as such. History has numerous examples of directives not being implemented timely and / or properly by EU

[134] I.e. Environmental Impact Assessment Directives, Water Framework Directive, Mining Waste Directive, Directives on Emissions from Non-Road Mobile Machinery, IPCC Directive, Industrial Emissions Directive, Outdoor Machinery Noise Directive, Air Quality Directive, Environmental Liability Directive, Seveso II Directive (AEA, 2012a).

Member States. To give an example, under current circumstances the Polish authorities have not fully implemented all existing European guidelines related to shale gas, e.g. the Waste Directive or the Directive on inland transport of dangerous goods. Furthermore, several issues are not part of the regulatory framework but, referring to ongoing debates in the US, would deserve attention in case of commercial exploitation of shale gas. The most obvious examples of this are the lack of specific requirements regarding the prevention of contamination of ground and surface water or the absence of specific disclosure procedures on hydraulic fracturing fluids. Next to environmental and procedural regulations, Poland has to meet the obligations as laid down in the European legislation for the internal market of gas (European Union, 2009). Though in theory the Polish market is open to competition since 2007, some serious obstacles remain. State-owned incumbent company PGNiG represents 97.5% of gas sales in the country and is also responsible for all distribution networks in the country. Therefore a competitive gas market in the years ahead is difficult to envisage. Also, it remains to be seen when natural gas price regulation for both industry and end consumers will be abandoned. These problems were reiterated recently, when the EC published an overview of pending infringement procedures, one of them against Poland for not properly implementing both the Second and the Third legislative package (European Commission, 2012).

So what if regulations have not been implemented? Formally, under the Treaty of the Functioning of the European Union, the EC guards over proper implementation of European law in the Member States and can start infringement proceedings in case of non-compliance. Ultimately it may also refer the case to the European Court of Justice. History has shown that the Commission sometimes struggles to compel Member States to implement European law, despite its formal powers to do so. This issue is further addressed in chapter 6 of this thesis. However, in the specific case of shale gas, it seems that Poland is increasingly becoming isolated, in that its officials are practically alone in Brussels advocating shale gas exploitation. Therefore, despite its importance in Brussels, the EC is expected to have substantial leverage to motivate Poland to implement relevant legislation promptly.

Gas Infrastructure

Infrastructure is crucial to the functioning of any gas market and it has been argued that the organization of infrastructure in the US contributed to a large extent to the developments regarding shale gas (see e.g. Medlock III, 2012b). This section will touch upon these issues and the remaining infrastructural challenges in the US, before turning to the EU. Here the focus shall be on Poland, where in the years ahead shale gas extraction – if at all to happen in Europe – is expected to occur. The argument made here, bluntly that Poland is not ready for shale gas extraction, does not necessarily add up for other European Member States that have shale gas resources under their soils. Yet ironically, most Member States that have well developed infrastructure do not appear to have an interest to proceed with shale gas extraction on short notice.

United States

Market structure is an important characteristic to consider when assessing why shale gas production in the US has taken off the way it has. Some labeled it 'most underappreciated factor that positively benefited shale gas production' (Medlock III, 2012b). Arguably small producers played a significant role in the push for shale gas production that the US has undergone during the last decade. One characteristic typical to the US market that has contributed to this development, is the unbundling from capacity rights from pipeline ownership (Ibid.). This means that the owner of a pipeline cannot also own natural gas flowing through it. Without a 'personal' interest of the pipeline operator, any company can access the market through competitive bids. This is different to market structures on the other side of the Atlantic Ocean, where small producers may in fact be hindered to access the markets.

The only issue related to infrastructure in the US that has been fiercely debated relates to expanding gas infrastructure investments to facilitate the increasing share of natural gas for expanded gas-fired electricity generation.[135] With abundant and cheap natural gas being a favorable fuel to generate electricity and the foresight of cheap natural gas being an incentive to invest in additional gas-fired electricity generation capacity, the open question is who should pay for the infrastructure linking these pipelines to the grid.

European Union

Poland is a gas country under construction. The share of natural gas is limited, with a yearly domestic consumption of around 14 bcm, forming roughly 13% of the country's primary

[135] http://eenews.net/public/energywire/2012/07/16/1

energy consumption. Of this gas, two thirds are imported, exclusively from Russia. Given the limited role of natural gas, it cannot be a surprise that gas infrastructure is not substantially developed. To give an example, only 54.6% of Polish households is currently connected to gas networks (Central Statistical Office (Poland), 2012). Most pipelines are located in the Southwest of the country, where industry is clustered, and around the main urban areas, but not necessarily in the areas where shale gas would be produced. Furthermore large transit pipelines have been built across the country from East to West.

Following the potential extraction of shale gas resources and continued high dependence on Russian gas imports, increased investments in Polish gas infrastructure are made. The demand forecasts used by the national transmission system operator, called Gaz-System, show that maximum gas demand in Poland is expected to double within this decade, to 30 bcm in 2021. First, Gaz-System has been investing in interconnection capacity to get the Polish gas market out of its isolation and connect it to neighboring countries to its West and South. The existing interconnector with Germany in Lasów has been upgraded to a maximum capacity of 1.5 bcm starting January 2012. To the South an interconnector has been launched in September 2011 on the border with Czech Republic at Cieszyn with a capacity of 0.5 bcm, albeit not yet two-directional. These investments are part of the Transmission System Development Program for 2010 – 2014 in which 1000 kilometers of new pipeline are envisaged.

Next to these commissioned projects, several interconnections are under study. In January 2012, Gaz System and its Lithuanian counterpart Lietuvos started a feasibility study on an interconnector between the two countries. In 2013, Gaz System and Eustream are expected to present their findings regarding an interconnector between Poland and Slovakia. Later this year both existing interconnectors with Germany and Czech Republic may receive green lights for further upgrade as well. Both these projects were substantially financed through the European Energy Program for Recovery (European Union, 2010b), i.e. € 10.5 million for the Czech interconnector and € 14.5 million for the German interconnector.

Several other projects could contribute to further diversification of gas supplies in Poland. One example is an LNG terminal that is constructed in Świnoujście in the Northwest of the country. Its maximum capacity is 5 bcm at a cost of € 700 million, of which roughly half is financed by the EC.[136] In addition the European Investment Bank has loaned Poland approximately € 135 million to realize this project (European Investment Bank, 2011). Next to the LNG terminal the so-called Baltic Pipe is in its pre-construction phase, eventually aiming to link Poland and Denmark. It is intended to give Poland access to Norwegian gas, while the Danish have expressed interest in receiving Russian gas through Poland. The EC wants to invest € 150 million in this pipeline (European Commission, 2009).

And then there may be shale gas. The verdict of private companies is out and that is currently the most important issue regarding the potential future development of natural gas. Yet there are likely infrastructural hurdles to be overcome. Considering the geographic location of shale gas resources, spread out from the North around Gdańsk to the Ukrainian border in the Southeast, additional investments in infrastructure may be necessary to ship large amounts of shale gas, either domestically or internationally. Even without those additional investments, on-going infrastructural projects may well occupy at least the first part of this decade. With substantial new supplies coming online from then onward – with for instance the commissioning of the LNG terminal in Świnoujście – the pressure is on for Polish transmission system operators and policy makers to prepare its domestic market for either gas consumption or significant gas imports and exports.

Energy Security

While industry balances geologic and economic realities to assess local potential for shale gas extraction, political and academic debates have suggested another pressing agenda: energy security. This elusive concept comes in different forms and shapes (Yergin, 2006). In the subsequent sections, this is eluded to in both the US case and the European one. Again, the European case will focus on the example of Poland, where security considerations are high on the agenda and play an important if not decisive role.

United States

Roughly since 2000 it became clear that US natural gas consumption could no longer be stilled with domestically produced gas. In order to attract foreign gas, major companies

136 http://www.pnb.pl/index.php?option=com_pnb&view=file&id=7WYSFcMtpbfDyfbnyU9&sid=b1496916&ext=21#start

invested in LNG terminals. In the meantime however smaller independent enterprises sparked the domestic quest for unconventional gas, amongst others shale gas. A decade later, the boom turns out to be enormous and experts suggest that by 2016 the US could be a net exporter of natural gas (US Energy Information Administration, 2011a).

Not everybody likes that idea though. In early 2012 the Committee on Natural Resources of the US House of Representatives urged Secretary Chu to investigate the consequences of exporting liquefied natural gas (LNG), because of worries that exporting natural gas would raise domestic energy costs, reduce business' global competitiveness, make the country more reliant on foreign sources of energy and slow the transition to a low carbon economy.[137] Although it is likely that the restrictions on exports of LNG are loosened at some stage (as touched upon earlier in this chapter), the debate on future LNG exports is on-going at the time of writing.

European Union

In Poland energy security is rooted in profound distrust of Russia and even Poland‘s fellow EU Member States on questions of energy resources. This is perhaps not surprising, given the history of war, subjugation, hegemony, and mistrust in this part of Europe, historically often under the yoke of Russia and Germany. But alongside the tragedies of history is a seemingly unacknowledged reality that Russian companies have been stable suppliers of both natural gas and crude oil to Poland for many decades. During the oft-cited price dispute between Russia and Ukraine in January 2009, which caused supply interruptions to European consumers and caused some in Southeastern Europe to actually go without gas for several days, Gazprom actually increased shipments substantially to Europe via the Yamal pipeline (which traverses Belarus and Poland), so that consumers in Poland and Germany did not feel the interruption (Le Coq and Paltseva, 2012).

Dependency on Russia has been a heated topic of discussion in the EU, and Poland in particular. Some have even speculated that the development of unconventional gas resources in Europe is enabled by the unpredictability of Russian supplies (Kuhn and Umbach, 2011). The inauguration of the Nord Stream pipeline linking Russia and Germany beneath the Baltic

[137] The full letter can be found on http://democrats.naturalresources.house.gov/sites/democrats.naturalresources.house.gov/files/content/files/2012-01-04_LTR_ExportingNaturalGas.pdf - Last accessed on 10 October 2012.

Sea represents a strategy by governments, Gazprom, and Western European industry to reduce transit risk by bypassing intermediary countries such as Ukraine and Belarus. The reaction in Poland to the Nord Stream pipeline was negative, since it was also bypassed by the pipeline. It urged some observers to recall the past, calling Nord Stream the Molotov-Ribbentrop pipeline (as described by Le Coq and Paltseva, 2012) and even the then defense minister Radek Sikorski made allusion to the Nazi-Soviet non-aggression pact in 2006 (Roth, 2011). Since the inauguration of the Nord Stream pipeline, there has been a great fear in Poland that Russia would be in a better position to use gas as a political instrument.

Yet there are some things worth noting. Several assessments of the risk to EU gas supply have highlighted the lack of interconnectivity within the EU, and not Russian aggression, as being the main transit risk (Noël, 2009; Le Coq and Paltseva, 2012). Contrary to a commonly held view, transit risk did not increase in the period 1998-2008 (Le Coq and Paltseva, 2012). While the Kremlin has used its energy export capabilities as a short-term leveraging tool in the past, historical examples of this underscore the point made by Larsson (2006) that supply interruptions targeted at Poland or another EU member state are highly unlikely, as are long-term cutoffs that would impact Poland or another EU member state for an extended period of time. Moreover, more often than not Russia failed to achieve the political concessions it sought with supply disruptions (Smith Stegen, 2011).

According to some, energy policy discourse in Poland exhibits a high degree of ‘securitization’, i.e. the topic of energy is often framed in terms of national security and an existential threat (Roth, 2011). As discussed in chapter 2, others have questioned whether energy security, certainly in other parts of Europe, has not merely been politicized (McGowan, 2011). It is also unclear why, if Russian natural gas is perceived as an existential threat, Polish authorities have not done more to develop alternatives to counter this potential threat. Investments could have been made in for instance a pipeline with Denmark, connecting Poland to large reserves of alternatives of Norwegian gas, or in interconnection and reverse flow facilities with Germany, so that the country would have been connected to alternative supplies from Northwestern Europe. The fact that Poland did not do this seems to be evidence that this is not an example of securitization in the way the Copenhagen School perceives it. More research is needed to assess why Polish policy makers have not developed alternatives for Russian gas. Nevertheless, the security aspects of the current shale gas discussions in

Poland are noteworthy, and the debate stands in contrast to energy discussions in other parts of Europe. Values and beliefs, so important in shaping social orders according to North (1991) also vary substantially through Europe, this example demonstrates. Since joining the EU in 2004, Poland has been a strong voice in bringing energy to the fore of discussions of European external relations amid widespread perceptions in Central and Eastern Europe that energy policy in the EU prior to the 2004 enlargement had not sufficiently addressed Europe‘s overdependence on energy imports (Roth, 2011). It was largely Polish efforts that led to ‘energy solidarity’ language being inserted into the Lisbon Treaty. As discussed, Poland has actively – and arguably quite successfully – lobbied to get European funds to build its energy infrastructure.

While the framing of shale gas in security terms in certain circles of the Polish elite is perhaps understandable, it is also very likely counterproductive given the actual administrative and legislative hurdles that could impede the development of this resource. Moreover, in lack of coordination, Polish efforts to excite other Member States for future shale gas extraction have appeared rather opportunistic. Just before the country became the President of the EU it suggested that shale gas extraction should be a project of common interest, while six months later this position had shifted (Wyciszkiewicz et al., 2011). It is worth noting that over the summer France had decided to ban hydraulic fracturing, while other Member States had announced further research into environmental concerns. To stress the dubious nature of this situation, the EC reiterated that it ‘remains neutral’ as regards Member States decisions concerning their energy mix.[138] It is unclear why the Polish chose to have this confusing discussion in the first place, for European institutions have historically not been involved with choices relating to Member States’ energy mix, as reiterated in the Lisbon Treaty.

Polish officials often argue that Poland’s dependence on Russian gas supplies is risky. Even if Russia was not a dependable supplier – which is questionable as just shown – it remains unclear why that would be a problem for a country that uses almost exclusively oil and coal as primary energy resources. Hence the irony is that current attempts of Polish transmission system operator Gaz-System, Polish government officials, European institutions and all others involved in the development of the Polish gas market, are in fact likely to increase future dependence on its most feared neighbor. Even when assumed that Polish shale gas will be

[138] http://ec.europa.eu/dgs/jrc/index.cfm?id=1410&dt_code=NWS&obj_id=15260&ori=RSS

extracted at some point, the most recent geologic forecasts demonstrate that there will only be sufficient supplies to cover a few decades. It makes sense to expect that at some point not just shale gas will run through those pipelines, but also increased LNG supplies, or Russian gas. In that sense the Polish lobby to extract shale gas and develop its gas infrastructure hence can be expected to increase its dependence on Russia, instead of decreasing it.

MLG Framework with Institutional Overview

Table 6 and 7 contain an institutional overview of decision-making structures in both the US and the EU regarding shale gas. It considers production, distribution and regulation. The findings are discussed below.

Discussion

Geologic realities are a crucial factor in the EU with regard to eventual shale gas extraction, similar to North America or any other part of the world. Yet environmental concerns that have been linked to shale gas extraction and hydraulic fracturing could, in contrast to the US, potentially halt extraction in the EU before it has started. Within existing EU governance structures, policies on energy supply and production are predominantly the purview of the individual Member States. Policies on environmental, water and air quality on the other hand are mostly developed in Brussels. The brief shale gas history in the US suggests that environmental regulatory authorities, policy makers and academia were caught off-guard and have been catching up with industry power-play since. Even up to date in the US it appears to be extremely difficult to institutionalize environmental regulation at the federal level, as for instance suggested by the repeated suspension of the Fracturing Responsibility and Awareness of Chemicals Act or the watered-down version of the rules for chemicals disclosure on federal lands that has been published by the Department of the Interior. While regulation could also be initiated on the state level, there is some evidence (e.g. disclosure of chemicals regulations) that this too has been difficult so far, i.e. many of the regulations that have been initiated do not seem optimal for their purpose, because they either require qualitative or quantitative data about the chemicals being used in operations, or contain several exemptions. It should be considered that some of the most pressing environmental concerns are still under research. The lack of clear evidence on causes and consequences may make it increasingly difficult to regulate environmental risks, and perchance easier for lobby groups to push their interests.

Yet while in the US the lack of clear evidence on environmental concerns is evidently not a reason to halt operations, in Europe this may be different.

In pinpointing fundamental differences between the US and the EU regarding shale gas, several elements stand out. First, market structure is an area that seems to have played an important role. As touched upon, the concept called ‘unbundling in the pipeline’ and relatively easy market access for smaller companies as a result thereof, appears to have enabled these smaller businesses to spur shale gas extraction on a large scale within a decade in the US. There is evidence that the larger companies had been investing in LNG terminals in the United States since the early 2000s, assuming that the US would rapidly become an importer of natural gas. Only at the end of the decade these companies realized that domestic production was exploding and subsequently they bought their way into the market, e.g. Exxon’s purchase of Texas based XTO Energy for $31 billion in 2009.[139] It seems reasonable to assume that the smaller gas companies have profited from low entrance barriers to the market, in combination with the lack of regulation of what was an unknown phenomenon at that time. More empirical research would be useful to determine exactly what the role of smaller and larger enterprises in the first decade of shale gas extraction in the US has been.

As appears from the institutional analysis, another important distinction between the EU and the US can be found on the local level. The US is unique in that resources found under the earth’s soil are property of the land owner. Hence, with roughly 80% of current shale gas extraction taking place on private lands, land owners play a crucial role. Without their consent there is no shale gas extraction. That is a fundamental difference from any other country in the world, where the state usually owns whatever is in the ground. Of course, access to land can in the US situation be bought. Common features in lease contracts include signing bonuses, royalties, rents, and so on. Reports on the developments of these conditions show remarkable changes over time and differences per state. To give an example, in Pennsylvania in 2003, private landowners received about $12 per acre in signing bonuses and a 12.5% royalty rate for shorter-term leases of five to seven years. In 2008, payments of nearly $2.900 per acre and 17% - 18% royalty rates for these same leases were not uncommon (Andrews et al., 2009).

[139] http://www.bloomberg.com/apps/news?pid=newsarchive&sid=anlPM8zJ_rE4

Governance level	*Public domain*	*Private domain*
Federal	# US Environmental Protection Agency - Regulates air quality from 2015 onward. - Investigates impacts of hydraulic fracturing on water, unclear whether eventually decisions shall be taken at federal or state level. # Department of Interior installed disclosure measures for hydraulic fracturing operations on federal and Indian lands (roughly 20% of US gas production) # Federal lands are administered by for example National Park Service, US Forest Service and Bureau of Indian Affairs. # FERC decides over interstate gas pipelines (see chapter 4).	# Investments in interstate gas pipelines are made by private consortia, usually operators and shippers.
Interstate	# Water related issues (conservation, utilization, withdrawal, development and control) are regionally decided upon in regional governmental agencies, where governors of the relevant states and representatives of the federal government take part as well. See for instance Susquehanna River Basin Committee (Pennsylvania, NY State and Maryland) and the Delaware River Basin Committee (Pennsylvania, NY State, New Jersey and Delaware).	

State [140]	# The primary regulatory authority for shale gas extraction is on the state level. Only air quality and disclosure rules on federal lands are regulated from Washington, DC. # State regulators (EPA, Texas Railroad Commission and many others) have initiated varying disclosure rules in some states. Other forms of regulation are designed here as well, for instance waste water treatment, intrastate pipelines, site abandonment, taxation, permitting, safety, etc. In most states a number of agencies have responsibility regarding the regulation of shale gas extraction, e.g. agencies for environmental protection, conservation, emergency management, transportation.	# In particular private smaller companies are claimed to have played an important role in the early history of fracking. Later on larger companies (majors) came into the market.
Regional & Local		# Local citizens owning land have had a decisive say in shale gas extraction, and many did agree with the industry moving in, arguably motivated by financial motivations (selling land / property rights to gas companies). Roughly 80% of US gas production takes place on private lands.

Table 6. US decision-making regarding shale gas

[140] US state regulations and the distribution of responsibilities varies from state to state. An accurate example of the broad spectrum of responsibilities and involved agencies is provided by Blohm et al., 2012, p.362 and further. It is worth noting that their analysis does bypass mineral rights ownership, while in this analysis the local level is labeled as one of the important levels of decision making.

Governance level	*Public domain*	*Private domain*
Supranational / EU	# EC institutions are largely responsible for regulation of environmental pressures in terms of land-take, releases to air, noise pollution, surface and groundwater contamination, water resources, biodiversity impacts, traffic, visual impact and seismicity. # EC does occasionally (co)finance gas infrastructure projects in the Member States, though only in exceptional cases	
Interstate (EU Member States)	# Water related directives are sometimes coordinated on a regional scale, e.g. when large cross boundary rivers are concerned, yet implementation of law is national affair. Coordination may vary throughout the EU.	
State / EU Member States	# Implementation of EC directives is a national responsibility. Noncompliance can eventually result in arbitrage at the EU Court of Justice, but usually depends on context, number of Member States being noncompliant, etc. # Implementation of water directives is a national affair. # Exploratory shale gas activities are done by both public (for instance PGNiG, Poland) and private companies.	# Exploratory shale gas activities are done by both public and private companies # Planning and investment of infrastructure mostly occurs on national level, by both public and private companies. Incidentally cross border investment occurs as well (e.g. Netherlands – Germany, GTS).

	# Planning and investment of infrastructure mostly occurs on national level, by both public and private companies. Incidentally cross border investment occurs as well (e.g. Netherlands – Germany, GTS). # Contrary to the US ownership and mineral rights reside in the national public domain. Therefore, decision making on the local level is limited. Taxation is also a national domain.	
Regional & Local	# Limited formal decision-making powers, but influence in protest movements not to be ignored, see for instance France, Netherlands, and Germany. Also, environmental permits may have to be issued at the regional and local level.	# Though formally decision-making powers may be limited, influence of local players has been argued to play a role in the Dutch decision to postpone hydraulic fracturing operations. More examples of this may be available throughout the EU.

Table 7. EU decision-making regarding shale gas

On the other hand of the spectrum, without this generous financial compensation, how would local citizens benefit from shale gas extraction? In France the lack of these local benefits has been mentioned – in combination with risks and nuisances linked to shale gas extraction – as one of the reasons to be against extracting shale gas resources and ban the technology of hydraulic fracturing (Leteurtrois et al., 2011, p.44/45).

As available evidence from Poland – arguably the European front line of shale gas extraction – suggests there can be several local barriers that hinder commercial extraction. First of all there are geologic realities, as confirmed by the substantial downgrades in recoverable reserves that the Polish Geological Institute published in spring 2012. Even if the geology is favorable, other factors are of importance. In the case of Poland the first is market development, in terms of building sufficient infrastructure, either for domestic consumption or for export, but also in terms of market access, e.g. shaping a market that is not monopolized by one state-owned company or end regulation of gas tariffs. Second, implementation of existing regulations and directives is required. Though – as chapter 6 shows – there are many more examples of European Member States being noncompliant with existing legislation and although the punitive route to the European Court of Justice is a time-consuming affair and its effectiveness in some cases can be questioned, at the end of the day the EC has a decisive say on most regulations that are related to environmental concerns that have been linked to shale gas extraction. The increasingly isolated position of Poland in the EU on the topic of shale gas extraction automatically seems to strengthen the position of the EC regarding this matter.

One element that has undoubtedly been of importance in shale gas discussions is the elusive concept of energy security. As shown in the analysis this concept seems to bring along many unfounded claims on both sides of the Atlantic Ocean. In Poland, it has been used repeatedly to spur the EC to express its support for shale gas extraction, even though historically the energy mix is an area left exclusively to the Member States. As shown, these Polish efforts probably did not help the Polish case. In addition the case of the US suggests that a state approach in terms of getting large-scale shale gas extraction started can be rather effective and no federal intervention is required here. At the time of writing, Poland seems to be the member state in the EU that still needs to be convinced of this.

Decision-making structures in this case study do not seem to differ greatly. On both sides of the Atlantic Ocean decisions regarding the extraction of energy resources are taken at the state level. As a result of this on both sides opponents and proponents of shale gas extraction are found, though the latter prevail in the US and are scarce in the EU. It is worth noting that on the federal level there appears to be more support for shale gas extraction in the US. One can think of the financial support for the development of technology in the 1970s (e.g. Boersma and Johnson, 2013) or President Obama's speech when visiting Poland in 2011.[141] European institutions have been reluctant to express a position other than neutral regarding shale gas extraction, confirming the exclusive mandate of its Member States, both those in favor (Poland) and those who oppose (most notably France and Bulgaria). In addition it is worth reiterating that although in the US the state decides whether shale gas extraction is allowed from under its soils, the local level too is of importance. This is due to the unique mineral rights legislation, which in a nutshell prescribes that the owner of land also owns what is underneath it. Hence landowners can lease their land to gas companies in order to extract natural gas and reap the – often substantial – financial benefits.

In terms of environmental regulation decision-making structures in the US and EU seem to be slightly different. European institutions seem to have been more effective in installing environmental regulations than their US counterparts have. A part of the explanation for this may lie in the fact that in the US 'the market' is in the driving seat, instead of governmental and regulatory institutions. There may be several reasons for this. First, the currently preferred technology to extract shale gas has not been taken serious for a long time. Even though public private partnerships had been working to develop the technology since the early 1970s, it was not before the early 2000s when commercial extraction of shale gas took off. As discussed, it took the incumbent companies almost another decade to acknowledge the potential of this technology. Second, federal authorities in the US traditionally have been reserved to draft policies that can also be drafted on the state level. Resource extraction is considered to be such an affair. The exception is air quality, where the EPA has a mandate, but so far its attempts to regulate hydraulic fracturing and shale gas extraction have been hindered by legal exemptions and political obstruction. In Europe, the European Environmental Agency merely collects and analyses data, whereas European institutions draft regulations and Member States are responsible for implementation. It is worth noting that in substantial parts of the US environmental regulatory authorities are viewed with skepticism and sometimes even outright

[141] http://www.whitehouse.gov/the-press-office/2011/05/28/remarks-president-obama-and-prime-minister-tusk-poland-joint-press-confe

hostility (see Rahm, 2011). This is different from Europe, where environmental policy generally receives broad public support.[142]

Thus, from a European perspective this is a case *par excellence* for European integration. Whereas resource extraction is an exclusive domain of the Member States, regulation of environmental risks associated with resource extraction is predominantly a European affair. The result in this case seems to be reluctance in Poland to move ahead with resource extraction, amongst others because more support from 'Brussels' is desired. It is worth reiterating that the analysis showed that substantial hurdles have to be overcome in Poland to facilitate large-scale extraction of shale gas as well. European institutions on the other hand have repeatedly declared to be neutral with regard to shale gas extraction, a position seemingly aiming to satisfy all Member States, from those who embrace shale gas to those that have legally banned it.

The next chapter turns to several building blocks of the EU gas system, i.e. planned and available infrastructure, implementation of legislation, market trade and long-term contracts and the role of liquefied natural gas. Again, the US gas system is used as a benchmark.

[142] Though more empirical work would be helpful, this EC document provides an illustration: http://europa.eu/pol/env/flipbook/en/files/environment.pdf

6. EUROPEAN UNION GAS MARKET STRUCTURE – TRACING THE US EXAMPLE?

"If it wasn't for the mist we could see your home across the bay…You always have a green light that burns all night at the end of your dock."
The Great Gatsby – F. Scott Fitzgerald

Introduction

A number of studies of European natural gas markets make reference to their counterparts in the US (e.g. Creti and Villeneuve, 2005; Neuhoff and Von Hirschhausen, 2005; Ascari, 2011; Vazquez et al., 2012). Generally, this market receives positive reviews in terms of being well integrated, demonstrating substantial liquidity on most of its trading hubs and high churn ratios. European institutions have been reforming European gas markets with the aim to increase competition and create one single market, yet this proves to be a lengthy and complex task that has not been completed to date (see e.g. European Commission, 2007; European Commission, 2012). An example of Europe's reforms is the Gas Target Model (see box 3 on page 65), which amongst others envisages an increase in spot market trade to realize gas prices based on gas-to-gas competition, instead of the historically accepted oil-indexation. Arguably, in Northwestern Europe a trend towards more spot-market trade and less long-term contracts can be envisaged (Pearson et al., 2012). Some have, based on an empirical test of the Law of One Price, argued that in this part of Europe gas markets in fact are reasonably well integrated (Harmsen and Jepma, 2011). Renou-Maissant (2012) also reported that strong integration of gas markets in continental Europe (in a case study that used data from France, Germany, Italy, Spain, Belgium and the United Kingdom) has been established, with work to be done in Belgium and the United Kingdom. In other studies in particular the United Kingdom and the Netherlands are been reported to have mature gas trading hubs (as an indicator for market functioning), whereas others in continental Europe fall behind (Heather, 2012). Several studies make note of the slow development of spot markets in continental Europe and an increasing division within the EU, with spot market trade prevailing in the United Kingdom, the Netherlands and Belgium and long-term contracts remaining prominent in the rest of Europe (Abada and Massol, 2011; Asche et al., 2013). Asymmetrical developments like these have been allocated to slow progress towards liberalization and competition in continental Europe (Stern, 2007). Also, Spanjer (2009) suggested that the disappointing progress of competition is due to insufficient implementation of legislation as well as the lack of coordination and integration between Member States.

Ascari (2011) has argued that after implementation of the third legislative package the EU will have several building blocks similar to the American model, i.e. effective unbundling of transportation and supply, regulated tariffs which are largely related to capacity and distance, and industry leading open processes of investment decisions.[143] Yet, as is elaborated in this case study, effective implementation of even existing EC legislation is far from certain. This, among other reasons, is why Makholm has concluded that even an updated and expanded third package will not result in more competition or increased supply security, as competition is hindered by a wide range of institutional barriers (2012, p.172).

In 2010 the 18th Madrid Forum invited the EC, national regulatory authorities and others to examine the interaction and interdependence of all relevant areas for network codes and to initiate a process establishing a gas market target model, comprising a vision for a future – more competitive – European gas market.[144] This call resulted in several reports about the shortcomings of the European gas system, and proposals for measures to safeguard stable and competitive gas supplies in the future (see i.a. Ascari, 2011; CIEP, 2011; Glachant, 2011).[145] In that debate, Ascari (2011) referred to the US gas market as an example of a competitive gas market from which Europe could draw lessons, for instance that long-term contracts can be a tool to generate an appetite to invest in new network capacity. Vazquez et al. (2012) observed that Glachant in his proposal puts more emphasis on the role of the regulatory authority to stimulate investments in new network capacity. CIEP (2011, p.22) argued that the European gas market cannot be 'shoe-horned' into theoretical economic model and should instead focus on attracting sufficient future supplies of natural gas, since Europe cannot afford the luxury of experimenting with its market design, because of its dependence on external resources. While the debate on the Gas Target Model is beyond the scope of this chapter, it is worth noting that

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[143] For a brief overview of this EU third legislative package, see for instance http://ec.europa.eu/energy/gas_electricity/legislation/doc/20110302_entry_into_force_third_package.pdf - Last retrieved on November 26, 2012.

[144] The European Gas Regulatory Forum (Madrid Forum) has gathered once or twice since 1999 and was set up to discuss issues regarding the creation of the internal gas market – http://ec.europa.eu/energy/gas_electricity/gas/forum_gas_madrid_en.htm

[145] In total five proposals for a Gas Target Model have been submitted to ACER. The two proposals that are not addressed in this thesis are from Moselle and White (2011) and Frontier Economics (2011). Since this thesis does not get into the details of this ongoing debate these contributions are only mentioned here.

fundamental differences between gas systems in Europe and the US may hinder the full embracement of the latter model. Vazquez et al. (2012), based on their analysis of network services coordination, concluded that the US and EU have ‘few common points’: while the US gas system is organized in a market based setting with network services arranged in long-term contracts between producers and suppliers, in Europe network activities are preferably regulated and centrally organized at the national level.

This chapter sheds more light on the differences between the EU and US by exploring some key building blocks of the European gas system. The assessment is made by examining several components of the European natural gas system, i.e. available and planned infrastructure, implementation of legislation, market trade and long-term contracts, and the role of liquefied natural gas (LNG). This chapter examines this question by analyzing relevant policy documents, existing legislation and relevant academic contributions, and covers the period up to January 2013. It ends with concluding remarks and a discussion on consequences of the findings in terms of European decision-making structures.

Available and Planned Infrastructure

There are many reports arguing that the lack of infrastructure development has contributed to troubles in European gas markets. By now it is for instance broadly acknowledged that gas supply disruptions in 2009 (and likely also in 2006) in Eastern Europe could have been mitigated if there would have been sufficient reverse flow options, adequate interconnection and gas storage facilities (European Commission, 2010; Everis & MercadosEMI, 2010). Others have argued that future production of unconventional natural gas in Poland could be hindered by a lack of available infrastructure, despite the desire of local policy makers to exploit its supposed gas reserves (Johnson and Boersma, 2013). In 2012, the EC has established that major investments in infrastructure are still needed to safeguard security of supply. In particular the Baltic States, Finland, Malta and the Iberian Peninsula are referred to as ‘gas islands’ given their lack of interconnection facilities with neighboring countries. In addition single source dependency prevails in large parts of Northern and Eastern Europe (European Commission, 2012). In a broad review of the Southeastern region of Europe, under auspices of the Gas Regional Initiative, progression on interconnection and capacity in that region was evaluated as ‘limited…given the acute lack of network integration that affects the region.’ (Everis & MercadosEMI, 2010, p.71).

In 2012 the EC published its first overview of recent investments in energy infrastructure in the Member States. It had collected information on recent projects through legislation that had been adopted in 2010 and that aims to give European institutions access to more relevant data on the status quo of European investments in energy infrastructure.[146] With gas consumption in Europe growing alongside import dependency (from 48.9% in 2000 to 62.4% in 2010) realizing earlier investment estimates of € 70 billion in the period up to 2020 in gas infrastructure appears to be important.[147] Notifications from the Member States demonstrate that investments in national grids were mostly minor, except for Sweden, Greece and Poland.[148] By contrast, significant investments in cross border capacity have been reported, most notably in Germany, the Czech Republic, Italy, the Netherlands and Greece. It is worth noting that ten Member States used their option to be exempted from providing data for this analysis, making it incomplete and difficult to draw definite conclusions about the exact investment needs in terms of energy infrastructure.[149] The document furthermore reiterates the importance of so-called priority gas corridors, that were first mentioned in draft regulations for trans-European energy infrastructure. Looking at the corridors however, one cannot avoid the impression that almost the entire EU gas network is a priority (see figure 3).

[146] Regulation 617/2010 – http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:180:0007:0014:EN:PDF

[147] For EU import dependency statistics, see for instance http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Energy_dependency_rate,_EU-27,_2000-2010_%28%25_of_net_imports_in_gross_inland_consumption_and_bunkers,_based_on_tonnes_of_oil_equivalent%29.png&filetimestamp=20121012131838

[148] Data used in this section come from Commission staff working document Investment projects in energy infrastructure SWD (2012) 367, p.15 and further.

[149] Regulation 617 / 2010, article 3, sub 2. The ten Member States referred to are Austria, Germany, France, Ireland, Lithuania, Latvia, the Netherlands, Spain, Sweden and the United Kingdom.

EU priority gas corridors

- **NSI West Gas**, i.e. North/South gas interconnections in Western Europe, involving Belgium, France, Germany, Ireland, Italy, Luxemburg, Malta, the Netherlands, Portugal, Spain and the United Kingdom.
- **NSI East Gas**, i.e. North/South gas interconnections in central-Eastern and Southeastern Europe, involving Austria, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Hungary, Italy, Poland, Romania, Slovakia and Slovenia.
- **Southern Gas Corridor**, involving Austria, Bulgaria, Czech Republic, Cyprus, France, Germany, Hungary, Greece, Italy, Poland, Romania, Slovakia, Slovenia.
- **Baltic Energy Market Interconnection Plan**, involving Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden.

Figure 3. EU priority gas corridors and involved Member States[150]

It is critical to attract sufficient investments in gas transmission infrastructure, in particular when the majority of natural gas is imported (CIEP, 2011). According to the EC (2011), the required investments will not take place under business-as-usual conditions, because of problems related to permit granting, regulation and financing. As of late 2012 the EC is still under the impression that European investments in gas infrastructure shall not be sufficient to meet future demand.[151] In a study on available gas transmission infrastructure in Europe, or the lack thereof, Correljé et al. (2009) argued that in case of bottlenecks 'serious repercussions' have to be expected. Bottlenecks in this case are defined as a situation in which the lack of transmission capacity creates an imbalance between downstream and upstream of the pipeline. Downstream lack of capacity and uncertainty over future investments can create price spikes, while upstream there is no problem in terms of physical availability of natural gas (Ibid. p.12). The repercussions set aside it appears safe to assume that on-going uncertainty about future markets may also have upstream consequences, such as delayed or cancelled investments in new supplies. It is worth noting that broadly accepted market mechanisms (e.g. open seasons) to determine the necessity to build additional infrastructure are not always efficient: while markets signals may drive infrastructure investments, these signals are more likely to be correct where several market players operate, since more data may be assumed to contribute to the reliability of the reflection of market demand. Yet these

[150] Derived from draft Regulation 2011/0300 (COD), Annex 1 – http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0658:FIN:EN:PDF.
[151] EC staff working document Investment projects in energy infrastructure SWD (2012) 367, p.17.

market players can only be present if the infrastructure is available, creating a potential vicious circle. Hence, ensuring sufficient cross-border gas transport facilities may require a 'super-regional top-down approach, as well as the involvement of European and national political authorities' (Everis & MercadosEMI, 2010, p.73).

In the US investments in gas infrastructure are generally not considered to be reason for concern (Von Hirchhausen, 2008). As elaborated in chapter 4 several specific characteristics of the US natural gas system need to be taken into consideration. It is worth noting that the US has – next to one of the world's largest consumer market – also been a large producer of natural gas for a number of decades. US natural gas production has hovered around 200 trillion cubic feet (5660 bcm) for several decades and only recently exploded under influence of large scale commercial extraction of gas from shale rock layers. Decades before this shale gas revolution, several hundreds of thousands of gas producing wells have been reported throughout the country.[152]

Correljé et al. (2009) emphasized the resemblances between the US and EU market, in terms of market structure and design. They observed that both markets seek to attract additional external supplies, and in addition most natural gas is used to generate electricity. They also stated that international conflicts of interest that can be observed in the EU frequently are similar to those at the US interstate level. Yet unlike the EU, the US has an institution to regulate the market on the federal level, i.e. FERC. This institution is hailed for facilitating the recent substantial expansion of the interstate gas-grid system (Ibid., p.32). Arguably ACER that was established in 2010 could play a similar role in Europe, but in their analysis Correljé et al. were rather skeptical about its mandate and proposals to increase regulatory mandates of European institutions are according to them usually considered 'death-on-arrival' (2009, p. 40).

Another illustration of these complex debates between Member States and European institutions is found when examining recent proposals of the EC for a regulation on guidelines for trans-European energy infrastructure.[153] While in 2010 the EC communication on this matter was embraced by the Member States, the proposed regulation has been watered down

[152] For data, see for instance http://www.eia.gov/dnav/ng/hist/na1170_nus_8a.htm
[153] 2011/0300 (COD).

and delayed since its publication in late 2011.[154] Ironically, while the proposal for a regulation aims to overhaul the existing TEN-E policy and financing framework (as has been elaborated on in chapter 3, p.48 and further), with the compromise to draft lists of projects of common interests it shows resemblance with its (future) predecessor, for under TEN-E the ten-year network development plans also contain overviews of projects in three categories, i.e. projects of common interest, priority projects, and projects of European interest (the latter being primarily cross-border projects and therefore showing most resemblance with the project of common interest under the draft regulation for trans-European energy infrastructure). After all, the TEN-E policy and its three categories of energy infrastructure projects had resulted in a laundry list of projects that was so long that it eventually hindered substantial progress. Again, when everything becomes a priority, nothing really is. It is also worth noting that although adoption of the proposed regulation would provide the EC for the first time with a structural mandate to invest in energy infrastructure, the primary responsibility for developing gas infrastructure would still be at the Member State level (European Commission, 2012, p.9). In addition, the proposed budget for energy infrastructure, which is part of the Connecting Europe Facility, is € 9.1 billion for the period of 2014 – 2020, comprising only a fraction of the total envelope that according to EC estimates is needed for energy infrastructure investments in that same period.[155] As of early 2013, Member States and European institutions are still arguing over what shall be projects of common interest, for Member States found the plans for energy infrastructure too broad and had objections to the financial consequences.

The US interstate pipeline system was not built during the last decade. Although substantial expansions have been realized recently (mostly fuelled by the boom in domestic production due to shale gas extraction), construction of the first interstate pipelines to transport domestically produced natural gas from the Southwest to the major consumer markets in the Midwest and Northeast already took off in the 1920s and 1930s, followed by investment in the central region of the country (Makholm, 2012). . Large-scale development of unconventional gas in several states in these regions (coal-bed methane in Wyoming, shale gas in Colorado, Texas, Louisiana and Oklahoma) may be expected to reinforce this picture. Moreover from the 1980s onward a substantial part of the natural gas destined for markets in

[154] COM (2010) 677 final.
[155] The total envelope for energy infrastructure was estimated to be € 200 billion up to 2020, of which € 70 billion for gas transmission infrastructure (European Commission, 2011).

the Midwest comes from Canada.[156] So, in 2008 the US counted 49 different locations where natural gas could either be imported or exported through pipelines from Canada or Mexico. This marks an important difference between gas systems in the US and Europe. While in the US natural gas is consumed all over the country, in Europe the picture is different. Instead gas consumption is mostly a Western European phenomenon, whereas in the Eastern Europe gas markets are marginal, with the exception of Romania, which has substantial domestic supplies of natural gas.[157] It is therefore not surprising that major transit pipelines – albeit Nord Stream, South Stream or Nabucco – all have Western European markets as final destinations, e.g. Germany, Austria and Italy.

Vazquez et al. (2012) observed that network activities in the EU are preferably regulated and centrally organized at the Member State level. To them this suggested that Member States' institutional power has influenced EU decision-making on this matter (Ibid., p.3). They noted that contrary to the US, where market players decide on investments and the federal FERC merely oversees that process, in the EU network planning is needed, even though a central planner in the EU would lack information in a market in which long-term contracts prevail.

The above demonstrates that from an infrastructure perspective comparing the EU and the US only makes sense to a certain extent. A decades-long history of pipeline network development and several net exporting regions within the country give the US gas system also substantial different features than its European counterpart. Makholm (2012, p.61) expressed skepticism about Europe's infrastructural challenges, and denied the quality of existing legislative packages in the EU, that in particular lack teeth in mandating transparency, requiring vertical separation, in uniting national regulatory rules and in powers of EU institutions in general. This seems to be in line with concerns as expressed in the most recent EU communications and legislation regarding its internal gas market (European Commission, 2010; European Commission, 2011; European Commission, 2012).

Therefore, in summarizing the above, regarding available and planned infrastructure it is safe to conclude that more investments are required to meet expected demand. The proposed

[156] For the full US EIA report, visit http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/index.html - Last accessed 2 December, 2012.
[157] http://ec.europa.eu/energy/energy_policy/doc/factsheets/mix/mix_ro_en.pdf

budget for critical infrastructure under the Connecting Europe Facility comprises only € 9.1 billion for energy infrastructure (next to natural gas also including electricity and carbon transport), which is not sufficient in view of the estimated total investments. Furthermore there are concerns whether existing regulations and institutional design can meet the challenges. There are profound concerns about the lack of coordination and integration between Member States (Spanjer, 2009; Correljé et al., 2009; Vazquez et al., 2012; Makholm, 2012). In addition these concerns are linked to the question whether ACER, that was established to coordinate regulatory actions on the member state level, has the necessary mandate to orchestrate sufficient and timely investments in gas infrastructure (as elaborated in chapter 3). Finally, this paragraph suggests that gas systems in Europe have been developing at substantially different paces, perchance further complicating integration (Abada and Massol, 2011; Vazquez et al, 2012; Asche et al., 2013). This chapter now turns to the issue of implementation of existing legislation.

Implementation of Legislation

As described in the third chapter of this thesis the EU has had a relatively brief but active history in energy policy making. In roughly fifteen years three legislative packages were disseminated throughout the Member States, aiming to improve market functioning by, amongst others, increasing transparency and further unbundling integrated gas companies. Yet in an assessment of the status quo the EC itself expresses its hesitance about the speed of progress being made: ‘Today the EU is not on track to meet this deadline (completion of the internal market in 2014). Not only are Member States slow in adjusting their national legislation and creating fully competitive markets with consumers' involvement, they also need to move away from, and resist the calls for, inward-looking or nationally inspired policies.’ (European Commission, 2012). The lack of implementation of legislation, for instance regarding vertically integrated gas companies, has also been subject to academic debate (Nowak, 2010). While he argued, in line with EC legislation philosophy, that unbundling is a precondition for competition in the EU gas market, others have argued that even when existing legislation would be implemented, there are still too many loopholes to establish effective pipeline regulation, although it is not entirely clear what those loopholes would be (Makholm, 2012, p.61). While that statement can certainly hold value, it seems worth examining where Member States stand with the implementation of existing legislation. Though relevant data are scarce, the EC in 2012 published an overview of both electricity and gas markets and cases where it started infringement procedures with regard to the second and third legislative package. These data were used in table 8.

It is worth noting that the list of Member States that have not implemented existing legislation in table 8 not necessarily represents the final version of this list. Member States that have initially reported that they have implemented existing legislation endured a *prima facie* check by EC officials, but it is possible that shortcomings are identified later. As Zhelyazkova (2013) observed, the EC cannot monitor everything.

Clearly much work remains to be done to implement legislation that was in fact scheduled to be implemented in March 2011. It appears that lack of implementation is a phenomenon occurring in the entire EU, and not something happening prominently in for instance Eastern Europe, as could have been expected given the relatively short history of natural gas and therefore modest role in this part of Europe compared to other parts. This is confirmed by Steunenberg and Toshkov (2009) who noted that in terms of transposition timeliness Central and Eastern European Member States are not doing worse than the rest of Europe. They did remark that transposition is not the same as actual implementation, but that it is a prerequisite for implementation. Nevertheless according to the EC energy market development is highly divergent between Member States, for instance when comparing Northwestern Europe with Eastern Europe (European Commission, 2012, p.9; see also Katz and Jepma, 2012).

So what can European institutions do in cases like these, in which a substantial amount of Member States fails to timely implement legislation? Formally the EC is responsible for ensuring that European law is implemented correctly.[158] In the first phase of the noncompliance procedure, called the infringement proceedings, the EC sends a reasoned opinion to the relevant Member State in which it unfolds its reasons why that Member State is not complying with EU law. The aim of this pre litigation phase is to offer a Member State the opportunity yet to comply with the relevant legislation. If the Member State fails, eventually the EC can refer the case to the European Court of Justice (ECJ) for the litigation procedure.[159]

[158] See article 285 and further of the Treaty of the Functioning of the European Union (TFEU).
[159] See also http://ec.europa.eu/eu_law/infringements/infringements_en.htm

Member State	**2nd Energy Package (gas)**	**3rd Energy Package (gas)**
Bulgaria	One case pending	Non-transposition case pending
Cyprus	No case	Non-transposition case pending
Estonia	Cases closed	Non-transposition case pending
Finland	Cases closed	Non-transposition case pending
Greece	One case pending	No case
Ireland	One case pending	Non-transposition case pending
Lithuania	Cases closed	Non-transposition case pending
Luxembourg	Cases closed	Non-transposition case pending
Poland	Two cases pending	Non-transposition case pending
Romania	One case pending	Non-transposition case pending
Slovakia	Cases closed	Non-transposition case pending
Slovenia	Case closed	Non-transposition case pending
Sweden	Cases closed	Non-transposition case pending
United Kingdom	One case pending	Non-transposition case pending

Table 8. Infringement procedures on the 2nd and 3rd Energy Package, as of 29th October 2012.[160]

[160] Data derived from EC staff working document Energy markets in the European Union in 2011, SWD(2012) 368 final, part III.

In fact, even when cases are sent to the ECJ there are incidental cases (i.e. Belgium and Italy) in which Member States do not even bother to comply with ECJ rulings and hence get convicted twice: first for noncompliance with European law and subsequently for ignoring an ECJ ruling (Börzel et al., 2012). The vast majority of cases however are solved in the early phase of infringement procedures (Panke, 2007). It remains unclear why some Member States settle noncompliance quickly whereas others do not (Börzel, 2001; Börzel et al., 2012). There is some evidence that Member States with political influence but a lack of institutional capacity (e.g. Italy) are worse implementers than Member States with limited political influence yet high capacity (e.g. Denmark) (Börzel et al., 2012). Also, EC and ECJ mechanisms to stimulate compliance, e.g. the transfer of financial resources and managerial know-how, may well be an effective way to reduce persistence in case of noncompliance (Ibid., p. 467). Panke (2007) observed that some cases of noncompliance demand judgments from the ECJ. These in turn create publicity and can empower proponents of compliance to put pressure on national governments. Yet it remains unclear to what extent this naming and shaming is effective in cases where so many Member States fail to comply with existing legislation. Also, it is ambiguous whether eventual penalties from the ECJ are sufficient to motivate Member States to comply. The laundry list of noncompliant Member States as presented in table 8, suggests that European institutions have a substantial amount of work left to be done.

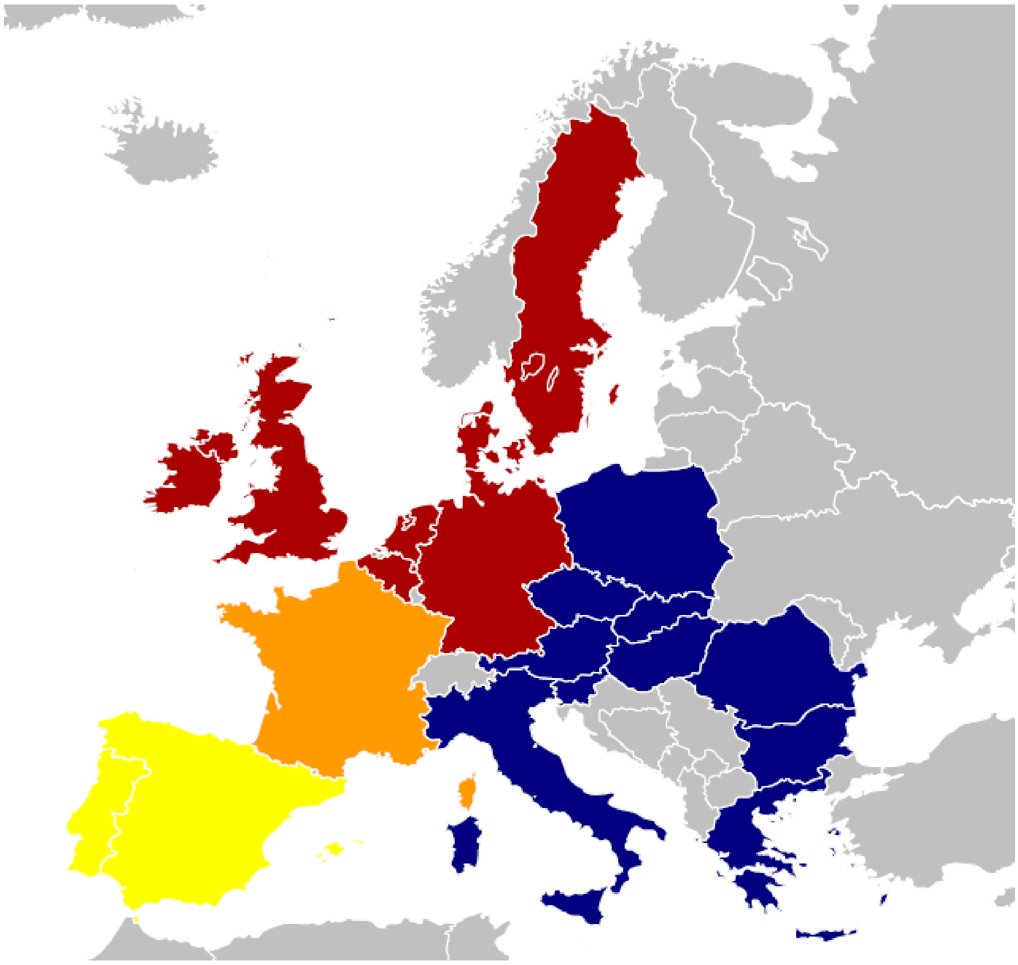
Market Trade and Long-Term Contracts

Through its liberalization process, European institutions intended to create one European energy market. Yet after three legislative packages, barriers appear to remain intact that hinder an increase in trade of natural gas in most parts of Europe. Cavaliere (2007) concluded that gas trade has been hindered by asymmetric implementation of legislative packages aimed at liberalization, but also by a lack of interconnection capacity and the exemption of transit pipelines from regulated third party access (see also Spanjer, 2009).

In 2006 ERGEG launched the Gas Regional Initiative (GRI), with the goal to speed up the integration of Europe's national gas markets.[161] As an interim step towards creating one single European gas market GRI created three regional markets with the aim to facilitate a top-down

[161] http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_ACTIVITIES/EER_INITIATIVES/GRI

push forward, by addressing competition distortions, such as lack of transparency, inefficiencies in balancing regimes and the lack of market integration. One of the main issues to address in the GRI was related to the further development of hub-based trading across Europe (Everis & Mercados EMI, 2010).



Map 1. Three regions of the Gas Regional Initiative. Note that France is part of both North-West and South clusters.[162]

In 2010, Everis & Mercados EMI observed, that while in the Northwestern region the issue of hub trade seems to have been picked up, there was less progress to report in the South-South East region. In the South region the only achievement was an analysis of the situation of gas hubs in the region. The authors therefore concluded that a top-down approach is required to establish operational minimum requirements at the European level (Ibid., p.86). Cavaliere

[162] Data derived from http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_ACTIVITIES/EER_INITIATIVES/GRI

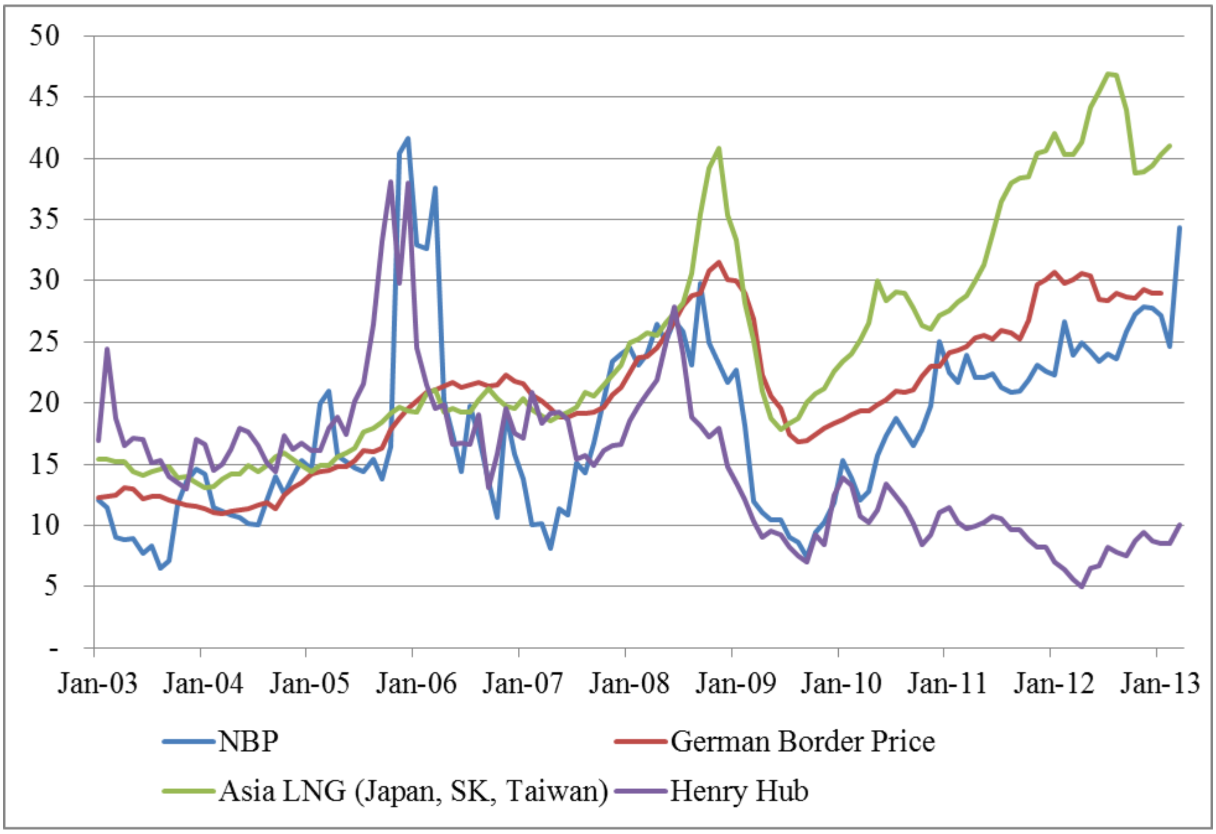
concluded that the case of Italy shows that ex-post regulation to foster gas trade was not sufficient to remove the bottlenecks, while some of these barriers are outside the national network (e.g. pipelines in other countries being owned by the incumbent gas company) and likely require ex-ante regulation at the European level (2007, p.39). Abada and Massol (2011) observed that spot markets in continental Europe are developing slowly and suggested that retailers in Europe still have an interest in engaging in long-term trade. It is worth noting that while in Northwestern Europe markets seem to move away from long-term contracts (see also Harmsen and Jepma, 2011; Renou-Maissant, 2012), in Eastern Europe the upstream market structure is more concentrated and long-term contracts prevail (Abada and Massol, 2011). This distinction is confirmed by Asche et al. (2013) who noted that spot market trading has been established in the United Kingdom, Netherlands and Belgium, but that long-term contracts remain prominent in continental Europe. Their results also suggested that gas prices in Europe are still determined by oil prices, but that it is unclear whether this is due to insufficiently deregulated gas markets.

Currently gas trade in Northwestern Europe continues to increase, with not just the British National Balancing Point (that has a record of being a mature trading hub for over a decade) but also the Dutch Title Transfer Facility showing rapid growth. In late 2012, the EC published data indicating a 27% increase of gas trade from 2009 to 2010.[163] The development of gas trade in the Netherlands has been attributed to the 2009 decision of Gas Transport Services to allow for quality conversion at TTF, a 'real time' balancing regime that proved to work well and increased available market information, an interest for the Dutch gas producer GasTerra to monetize its assets by selling gas on the market, and finally because TTF since May 2012 offers the first cross-border market coupling scheme, combining transport services of the Netherlands and Northern Germany (Heather, 2012).[164] His study also concluded that Europe has a long road ahead towards the creation of one single gas market, and that it is likely to expect a limited number of liquid and high volume trading hubs, together with a number of national hubs that show price correlation but not so much trade (Ibid, p.44).

[163] Commission staff working document, SWD(2012) 368 final, part I.
[164] This is important because it allows traders to supply or take both high- and low-caloric natural gas to and from the system, necessary because the large Groningen field in the Netherlands contains low-caloric while most imported gas is high-caloric.

It is worth considering the debate about the role of long-term contracts in European gas markets, which, as touched upon earlier, also features in the discussion about the Gas Target Model. Neuhoff and Von Hirschhausen (2005) noted that European long-term gas contracts used to be oil-indexed to protect the buyers of natural gas against prices higher than those of competing fuels. Thus these contracts functioned as a risk sharing device: the buyer of gas bears a volume risk (a minimum amount of natural gas to be purchased) and the seller has a price risk (in case prices for natural gas rise above the fixed price as agreed in the contract). Creti and Villeneuve (2005) observed that because these long-term contracts are inflexible in terms of demand and supply fluctuations, they usually contain clauses, e.g. a price floor with options to raise tariffs under predefined conditions, or a renegotiation of terms at predetermined intervals. It is worth noting that with the proceeding of liberalization of the EU gas markets, the duration of long-term contracts has diminished, from a 25-years period in 1980 to a 15-years period in 2000 (Von Hirschhausen and Neumann, 2008). Finon and Roques (2008) noted, in a study on investments in nuclear power plants, that long-term contracts can have positive effects on investment. De Hautecloque and Glachant (2009) also mentioned that long-term contracts ensure investments and reliability (at a hidden cost for society), but also pointed at some of their downsides, most notably the possibility of price restraints and foreclosure (when a significant share of demand is tied up in long-term contracts this may become an entry barrier for third parties).

In 2007 the EC reported in its sector inquiry that long-term contracts in European gas markets were one of the persistent barriers for new entrants into the upstream market. If these contracts were concluded by dominant firms and foreclosed the market, they may breach with competition rules, unless there were countervailing efficiencies benefiting consumers (EC, 2007, p.10). Also, the EC concluded that the aforementioned status quo ‘does not as such put into question existing and future upstream contracts’. This seems in line with an earlier observation of Creti and Villeneuve (2005) that the EC appeared to let the market decide about the future of long-term supply contracts and have them coexist with spot market trade. In 2009 Stern observed that decoupling has become ‘inevitable’ because of the gas supply surplus (2009b). Pearson et al. (2012) reported that this abundance in natural has been further increased by the large scale extraction of unconventional natural gas in the US. According to EC figures from 2011 the difference between spot market and long-term contract gas prices further increased due to increases in oil-indexed prices (European Commission, 2012).[165] These developments have made the difference between spot-market prices and those in long-term contracts so large that several utility companies had to renegotiate their contract terms with for instance Russian supplier Gazprom.[166] Graph 1 shows the development of prices of natural gas in € / MWh at four important global benchmarks, i.e. Henry Hub in the US, British hub NBP, German border prices, and the largest LNG markets in Asia, during the last decade.



Graph 1. Price developments at Henry Hub, NBP, German border and Asia LNG.[167]

Graph 1 shows that in the second half of 2008 prices at the trading hubs Henry Hub and NBP dropped sharply. This is attributed to the earlier mentioned gas surplus (e.g. Stern, 2009), in combination with the economic downturn. The data also show that prices at the German border and Asian LNG prices continued to rise in the second half of 2008 and dropped significantly later. Although German border tariffs are not an ideal reflection of long-term

[165] Commission staff working document SWD(2012) 368 final, part I, p.23.
[166] See for instance http://www.fitchratings.com/gws/en/fitchwire/fitchwirearticle/EU-Utilities-May?pr_id=769294
[167] Data derived from the following websites: http://www.customs.go.jp/english/, http://www.bafa.de/bafa/de/, http://www.eciaonline.org/eiastandards/, with special thanks to Thijs van Hittersum.

contract tariffs in Europe, they are used as an indicator. Hence, following these data, in the second part of 2008 and in early 2009, natural gas under long-term contracts in Europe was almost twice as expensive as spot-market traded gas at the British NBP. Anecdotal evidence suggests that this situation put pressure on producers of gas to lower tariffs under existing long-term contracts, and in addition that new long-term contracts are since increasingly indexed to prices on liquid gas trading hubs in Northwestern Europe, such as NBP, also TTF in the Netherlands or Zeebrugge in Belgium. More empirical analysis is required here. The data also show that since mid-2009 prices at the German border and British NBP have converged. This may confirm that existing long-term contracts have been renegotiated and that the prices in renewed contracts are more in line with hub prices, such as NBP. This would not necessarily mark the end of long-term contracts in Europe, for earlier mentioned advantages of those contracts in terms of security of demand and supply (e.g. De Hautecloque and Glachant, 2009) seem to be still in place. Rather, contract conditions may increasingly be altered and move towards hub-based prices. Again, more empirical work would be helpful here.

Stern and Rogers (2011) have concluded that there is no commercially viable alternative to hub-based pricing in the European gas market. They refer to a process that has taken place in the US in the 1980s and 1990s and note that the actual shift to hub-pricing mechanisms was in fact completed within a few years (Ibid., p.34). They also noted that revising existing contracts is painful, with difficult negotiations and litigation in foresight. In addition, in contrast to the US where the majority of those involved is under the same political and legal jurisdiction, continental Europe is highly diverse, as are its major suppliers. Boussena and Locatelli (2013) have observed an increased difference of opinion between Europe and Russia and attributed this to rules and standards that are based on different values and beliefs.

It is impossible to assess what exactly the future of oil-indexed gas contracts in the EU will be. The European Commission has reported a significant fall in the share of oil-indexed gas contracts in 2010 (from 68% of natural gas consumption to 59% in the year after), due to an increase in spot purchased gas (27% of gas consumption 2009 and 37% in 2010).[168] Currently anecdotal evidence from the Netherlands suggests that roughly 60% of gas trade in 2012 has been spot-based and that the process towards full hub-based trading is expected to be

[168] EC staff working document SWD(2012) 368 final, part I.

completed within five years. This means that new contract structures and formulas will become common sense, based on year and month terms instead of long-term, all lined to spot-trade prices. However, there is strong evidence that in continental Europe this transition cannot be expected within the next five years, if at all (Abada and Massol, 2011; Asche et al., 2013). Many unknowns make it difficult to predict the future of oil-indexed contracts in continental Europe, such as future supplies in general, LNG demand and supplies elsewhere in the world, the design of future carbon policies and the duration of the economic downturn.

It is complex to assess what the previous developments indicate in terms of EU decision-making. The EC finds it important that hub-trading is further developed in the Member States, because it is under the impression that Member States with well-developed gas hubs have benefitted from greater price stability, but also because prices of imported gas under long-term contracts have been lower in these Member States (European Commission, 2012).[169] At the same time the development of spot markets across the EU has developed asynchronous, with markets in Northwestern Europe being reasonably well developed whereas markets in continental Europe fall behind (Harmsen and Jepma, 2011; Abada and Massol, 2011; Renou-Maissant, 2012; Asche et al., 2013). Currently there are no indications that European institutions desire to prescribe the markets in what fashion natural gas should be contracted or traded, and hence long-term contracts and spot-market trade continue to coexist in the EU, following the interplay of preferences of producers and suppliers.

The Role of Liquefied Natural Gas (LNG)

The share of LNG in the EU has risen steadily from 10% twenty years ago to almost 20% in 2011 (European Commission, 2012). It is worth noting that just seven years ago only few countries appeared interested in LNG facilities, as table 9 demonstrates.

[169] EC staff working document SWD(2012) 368 final, part I, p.31.

Country	On-stream	Under construction	Planned
Belgium	1	1	0
Cyprus	0	0	1
France	2	1	3
Germany	0	0	1
Greece	1	1	2
Ireland	0	0	1
Italy	1	2	13
Latvia	0	0	1
Netherlands	0	0	3
Poland	0	0	1
Portugal	1	0	1
Spain	5	4	5
Sweden	0	0	1
United Kingdom	1	3	6
Total	12	12	39

Table 9. Status of EU regasification plants by country, 2006. Data: IEFE.[170]

The role of LNG is part of several on-going debates. First, while LNG's contribution to diversification of gas supplies in Europe is undisputed, Dorigoni and Portatadino (2008) questioned whether an increase in LNG would enhance competition on that market, since their data showed that in 2006 in Italy 73% of LNG capacity was operated by incumbent energy companies. Paraja (2010) however noted that LNG did increase the level of competition in the Spanish market, with incumbent companies owning less than 45% of natural gas in the market.

Second, it is unclear what exactly the role of LNG in Europe will be. Though the costs of LNG are generally higher than those of natural gas that is transported by pipeline, Dorigoni et al. (2010) suggested that LNG from countries like Libya, Algeria and Qatar can in Europe effectively compete with (increasingly expensive) Russian gas. Lochner and Bothe (2009), to the contrary, expected the share of LNG in Europe to decline up to 2030, since Europe's geographical location allows it to import large quantities of natural gas by pipeline at

[170] Data in this table have been derived from Dorigoni and Portatadino (2008).

moderate costs. Kumar et al. (2011) predicted that the share of LNG in Europe may rise to 25% in the long term, although it is unclear when that would exactly be. The ongoing debate about potential exports of natural gas from the US, as discussed in chapter 5, adds to these uncertainties. At this stage it seems unlikely that natural gas from the US will be able to compete directly in Europe, because it is generally more expensive than conventional natural gas that reaches Europe by pipeline from for instance Russia and Norway (Paltsev et al., 2011). However, large quantities of LNG from the US may displace LNG from for instance the Middle East and Nigeria to Europe (Henderson, 2012).

Industry data however suggested that in the short-term the center of gravity for LNG trade is increasingly in Asia. As of late 2012, Asia accounted for 71% of global LNG demand, in comparison to 64% in 2011 (GIIGNL, 2012). This increase is attributed to Japan’s closure of nuclear power plants in the post-Fukushima era, and also continued growth in upcoming LNG markets such as China and India. Europe’s share in global LNG trade, to the contrary, fell from 27% in 2011 to 20% in 2012, a decline that is attributed by the economic downturn and subsequent decreasing demand. The substantially higher tariffs for natural gas in Asia (as depicted earlier in graph 1) may further increase this trend.

Finally, LNG also features in a broader debate about natural gas and its role as a ‘transition fuel’ to a low carbon economy. While it is debated to what extent unconventional natural gas can be considered a clean fossil fuel, it is worth noting that the production process of LNG, that adds liquefaction, tanker transport and regasification to the life cycle of natural gas, also results in an increase in carbon emissions (Stephenson et al., 2012). More research is required into the carbon footprint of both unconventional gas and LNG.

	On-stream	Under construction	Planned	Suspended
Albania	0	0	1	0
Belgium	1	0	0	0
Croatia	0	0	1	0
Cyprus	0	0	0	1
France	3	1	0	1
Germany	0	0	0	1
Greece	1	0	0	0
Ireland	0	0	1	0
Italy	2	1	5	0
Netherlands	1	0	0	0
Poland	0	1	0	0
Portugal	1	0	0	0
Spain	6	1	1	0
Sweden	1	0	0	0
United Kingdom	4	0	0	1
Total	20	4	9	4

Table 10. Status of EU regasification plants by country, as of June 2012.[171]

As table 10 demonstrates by 2012 the number of regasification plants in Europe has almost doubled since 2006 and four more plants are under construction. It is worth considering the position of the Iberian Peninsula, in particular Spain, where LNG features dominantly in the national energy mix, comprising 76% of imported natural gas in 2010.[172] Spain imports natural gas from fourteen different countries, while its most prominent suppliers are Algeria (33%), Nigeria (20%) and Qatar (16%). So, the Iberian Peninsula has developed into an energy island and has one of the lowest levels of interconnection in Europe. Of the total entry capacity of the Spanish gas market, 6 LNG regasification terminals provide 49 billion cubic meters (bcm), while 20 bcm comes through two pipelines with respectively Morocco and Algeria. With European neighbor France there is only a 2.5 bcm interconnector that only allows gas to flow from France to Spain, despite repetitive calls from the EC that this situation

[171] Data based on available information on http://www.globallnginfo.com – Last visited 3 December 2012.
[172] SWD (2012) 368 final, part II, p.186.

should be improved (Suarez, 2010; European Commission, 2012). From 2015 onward there may be an extra gas interconnection facility in Catalonia. Meanwhile Spain has been investing to increase its storage capacity fourfold up to 2016, in order to deal with possible supply disruptions in LNG delivering countries and bad weather conditions that complicate landing of LNG ships (Paraja, 2010). It is not clear to what extent Spanish dependence on LNG supplies is a deliberate choice of Spanish policy makers following the mediocre connection to the European gas grid, or whether LNG is just more competitive given the distance between upstream activities supplying the EU and the Iberian Peninsula. In general LNG is favorable to pipeline transmission of natural gas for distances larger than 1.500 kilometers offshore or 3.000 kilometers onshore (Von Hirschhausen et al., 2008).

In 2008 the EC commissioned a study whether it should play a more active role in the LNG supply chain, that consist of upstream natural gas production and distribution, liquefaction, shipping, regasification, and finally storage, transmission and distribution. The results showed that there was limited need for an EU Action Plan for LNG from three different perspectives (Von Hirschhausen, et al., 2008). First, from an economic point of view the authors found no reasons that would justify EU action; increased LNG trade brings benefits in terms of security of supply, though increased global competition for natural gas can be a risk as well. Future low-carbon scenarios however predict a decrease of natural gas usage from 2030 onward since it is not expected to be competitive once coal can be combined with sequestration technologies. Also, most upstream activities of LNG are outside the sphere of influence of the EU, besides strategic partnerships it already makes. Second, from a regulatory perspective the authors examined mostly benefits of LNG in terms of security of supply. They concluded that security of gas supply (LNG, pipeline and domestic production) is not in danger in Europe, provided that the internal market works (Ibid., p.5). In Central and Eastern Europe LNG facilities may bring benefits, but inverting pipeline capacity to facilitate imports of natural gas from Western Europe may be equally beneficial to these single source dependent Member States. As the table 11 suggests, these countries currently lack sufficient transport and interconnection capacity, and without substantial investments therefore parts of Europe, most notably Central and Eastern Europe, are unlikely to benefit from the natural gas that is available in the EU, for natural gas cannot physically flow there.

Member state	Infrastructural bottleneck
Austria	No reverse flow options on the HAG pipeline, connecting Austria with Hungary
Bulgaria	A gas country under construction: Domestic infrastructure is not connected to large transit pipelines, there are limited interconnection and reverse flow options with Greece and Romania, and there are hardly storage facilities available.
Czech Republic	The country has successfully invested in the Gazelle pipeline, which links it to Nord Stream in Germany. More investments are needed in reverse flow facilities on existing pipelines, as are investments in storage facilities.
Estonia	In short, Estonia is an ‘energy island’ that requires significant investments.
Germany	Significant bottlenecks remain in terms of reverse flow options at the Polish border.
Hungary	Physical interconnection with Slovakia is lacking, as are reverse flow options with Romania. The connection with Austria is one-directional.
Latvia	Latvia is also typified as an ‘energy island’, where significant investments are needed to develop the gas system.
Lithuania	Like its Baltic brothers, Lithuania is an ‘energy island’ though an interconnector with Poland is under study.
Poland	Poland has made significant investments in recent years to develop its market. The domestic grid system needs substantial investment, as should regulated market policy and the dominance of the incumbent PGNiG be reduced. Also the Yamal pipeline lacks bi-directional facilities to allow reverse flow from Germany.
Romania	According to the European Commission much work needs to be done, despite substantial domestic production of natural gas. Domestic infrastructure needs to be connected to large transit pipelines. Also, investments should be made in an interconnector with Bulgaria, as in reverse flow options with Hungary.
Slovakia	An interconnector with Hungary has been planned, not built.

Table 11. Infrastructural bottlenecks in Central and Eastern Europe.[173]

[173] Data derived from EC staff working document SWD(2012) 368 final, part II, accompanying COM(2012) 663 final.

Discussion

This analysis of several important features of the EU gas system has shown the following. In terms of available gas transmission infrastructure, substantial investments are required to complete the internal gas market. Also, under business as usual conditions these investments are not expected to happen in time (European Commission, 2012). Contrary to the US, in the EU there is lack of an institute to orchestrate these investments, as infrastructure development remains a primary responsibility of the Member States. The expected decision regarding critical infrastructure investments under the Connecting Europe Facility does not fundamentally alter that picture. While for example Correljé et al. (2009) have argued that the mandate of ACER should be expanded to orchestrate these investments, this chapter suggests that would not be a panacea. That is because, next to lacking a supranational institute that guards over infrastructure investments, another important difference with the US is that in the US consumers are spread out across the continent, whereas in Europe the East and Southeast are undeveloped, in terms of gas consumption. Several studies have confirmed the asynchronous development of parts of the European gas system (e.g. Abada and Massol, 2011; Asche et al., 2013). A repeatedly addressed problem in the EU is the lack of coordination and integration (e.g. Spanjer, 2009; Correljé et al., 2009; Vazquez et al., 2012; Makholm, 2012). It is also worth noting that the US market did not develop overnight, but instead went through several decades of institutional history before it became the integrated gas system it is today.

In terms of implementation of existing legislation, European Member States and institutions have another long road ahead. As of late 2012, infringement procedures are pending against fourteen Member States, and that may not be the final number. Though the available literature suggests that this naming and shaming works in the majority of cases (e.g. Panke, 2007), it is not clear whether that will also be the case when so many Member States are noncompliant, as is the case here. Also, there is no clear evidence what the reasons are for rapid implementation of legislation, or the lack thereof.

Market trade is still hindered, despite several legislative packages. Reasons that have been mentioned for this are the lack of tradable gas (liquidity), inefficient use of transmission capacity, strategic withholding of transmission capacity, and asymmetric implementation of legislation across Member States, lack of interconnection capacity, contractual congestion and the many exemptions of transit pipelines from so-called third-party access. As of 2012, several studies suggested that markets in Northwestern Europe are reasonably well integrated (Harmsen and Jepma, 2011; Renou-Maissant; 2012; Heather, 2012), whereas in other parts of Europe long-term contracts prevail (Abada and Massol, 2011; Asche et al., 2013). Currently it is unclear what exactly the role of long-term contracts in Europe will be. The EC (2012) has reported an increase in spot-market trade and appears to embrace that development. Oversupply on the markets since mid-2008 have further increased the difference between spot-market prices and those in long-term contracts, sometimes resulting in renegotiation of contracts by suppliers and producers. Some studies have suggested that the phasing out of long-term contracts is unavoidable (Stern, 2009; Stern and Rogers, 2011), whereas others also mentioned that long-term contracts can have positive effects on investment (Finon and Roques, 2008; De Hautecloque and Glachant, 2009). It appears from the analysis that the EC intends to let long-term contracts and spot-market trade coexist, but that the conditions for long-term contracts in Europe may increasingly shift away from oil-indexation to for instance hub-based indexation, more in line with gas prices on for instance British NBP or the Dutch TTF.

LNG currently contributes to European energy security in terms of diversification and recent investments in LNG regasification terminals confirm this trend, although scholars do not agree about the future role of LNG in Europe, with some suggesting an increase of LNG in the next decades (Dorigoni et al., 2010; Kumar et al., 2011), and others predicting exactly the opposite (Lochner and Bothe, 2009). Industry data suggested that as of late 2012, the center of gravity for global LNG demand has further shifted towards Asia, whereas Europe's share has fallen from 27% in 2011 to 20% in 2012 (GIIGNL, 2012). It is also worth noting that Member States can only benefit from LNG supplies in a functioning internal gas system. As this chapter has argued, this is currently not always the case.

7. CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the conclusions from the previous chapters as well as recommendations in terms of policy making and future research. It consists of three parts, which together aim to provide answers to the research questions raised at the beginning of this thesis. The first part deals with the main theme of this research, i.e. EU energy security considerations arising from the internal gas system. The second part goes into European energy policy related issues and gives recommendations for future policy making and further research. The chapter ends with some brief reflections.

European Union Energy Security

This thesis aimed to assess whether EU energy supply is at risk because too many decisions are taken at a suboptimal level of policy-making. In short, the evidence suggests that this is the case for parts of the EU. This section presents the evidence that supports this overall conclusion.

The analysis of investments in gas infrastructure (chapter 4) suggests that EU and US regulatory regimes have a fundamentally different approach to generate an appetite for investments (see also Vazquez et al., 2012). In the US regulation is used as an investment vehicle (Joskow, 2005) whereas in the EU regulation focuses on efficiency, rather than security of supply or sustainability. As a result, investors in gas transmission infrastructure in the US are allowed to accrue substantially higher rates of return than their European counterparts, i.e. 15% compared to about 5%. In addition, regulatory periods in Europe are comparatively short and because of that returns on investment can vary substantially. The EC estimates that the necessary investments in gas infrastructure (of approximately € 70 billion in the period up to 2020) are not made under business as usual conditions (e.g. European Commission, 2010; European Commission, 2012). More research is needed whether in the US consumers, as a result of this generous regulatory regime, collectively pay too much for their gas transportation. Furthermore, the interviews taken for this study suggest that in the US there are millions of citizens that are not connected to gas distribution grids. Instead, these people use alternative fuel sources such as propane or wood. Therefore, it seems fair to presume that in the US non-economical pipelines are not being built as a result of this market oriented approach. Academic evidence does not provide a clear verdict in favor or against privatization of gas networks.

Chapter 4 also provides an illustration of (the struggles of) the European integration process. Since regulation of the transport of natural gas has predominantly been a responsibility of the Member States, it is hardly surprising that as a result Europe consists of a patchwork of different regulatory regimes (Larsen et al., 2006). This study gives several illustrations of the inefficiencies this has led to. In order to streamline national regulations in 2010 the Agency for the Cooperation of Energy Regulators (ACER) was established. Yet assessments of this organization have been critical, with studies concluding that it lacks decision-making powers and the right to set the agenda, that it has a mediocre budget, and that it is a ‘second best’ option (Coen and Thatcher, 2008; Correljé et al., 2009; Thatcher, 2011). It may be that some neofunctionalist scholars have been too optimistic in their assessment that European integration would eventually proceed in any case, even if that sometimes means taking a step back (Corbey, 1995). By now all stakeholders involved may be aware of this process and deliberately have seized cooperation. It is difficult to ascertain what exactly the reasons are that influence this process. Possibly the more marginal role of ACER in comparison to their peers in the Member States in the first phase after its foundation is part of conventional decision-making procedures in Europe. It could be that a large mandate at first would generate too much resistance, since ultimately enlarging ACER’s mandate would also mean reducing the influence of national regulatory authorities. It is reasonable to assume that academic and political verdicts of ACER would benefit from considering this logic. In general European integration is a lengthy process, without a preconceived objective. The political-economic-technological dynamics of energy-related issues in Europe should be assessed in this specific context. In other words, it is worth appreciating the unique setting in which European integration takes place. As such, the establishment of ACER as a European organization can also be evaluated as a substantial milestone, for it marks the acknowledgement that designing European energy regulation strictly at the Member State level leads to undesirable inefficiencies. On the other hand, it is likely that the transfer of decision-making powers from the Member State level to ACER is a lengthy process. The period in between may be one of relative uncertainty and unpredictability, conditions that generally do not improve the investment climate. This has led some to conclude that completing Europe’s internal market may take several decades (Makholm, 2012). CIEP (2011) has argued that the EU cannot afford a lengthy process like this, in times when global competition for energy resources is growing.

In addition, in chapter 4 questions have been raised about the political and legal accountability of ACER (e.g. Lavrijssen-Heijmans and Hancher, 2008). Similar concerns have been expressed with regard to national independent regulatory authorities. The oft-quoted argument to create these agencies as being independent from political control is to shift complex technical issues out of the political arena (Elgie, 2006). The majority of studies however have questioned the independent positions of these agencies in terms of democratic legitimacy and a lack of accountability (Larson et al., 2006, Christensen and Laegreid, 2007, Maggetti, 2009). Szydlo (2012) even argues that economic and social goals of regulatory authorities often collide, and that depriving national parliaments of legislative influence is in conflict with constitutional principles, such as the domain of the law. It appears that more research into the independent position of regulatory authorities is desirable.

The case study on shale gas extraction (chapter 5) demonstrated the landslide transformation that the US is undergoing in terms of domestic natural gas production. Clear effects have been identified on the ground in for instance rural areas of Pennsylvania, where once forgotten towns are blossoming again, new roads are being constructed to accommodate intensive truck usage, hotels have been built to house the workforce, and local jobs are being created. It is worth noting that the available empirical evidence suggests that earlier predictions about job creation have been too optimistic (Weber, 2012). Nevertheless, the US is expected to become a potential net exporter of natural gas in 2015, whereas until roughly 2008 most observers expected it to become a major importer of LNG. On the other hand the analysis also lays out several substantial environmental concerns that have been linked to shale gas extraction, most notably drinking water contamination, waste water treatment, air pollution, and induced seismic activity. Effective regulation of these environmental concerns on both the federal and the state level have so far not been very successful. It is possible that the lack of academic consensus on the environmental risks and their links with shale gas extraction further delays effective environmental regulation. Finally it is worth noting that in the US the extraction of shale gas is not embraced in full. The legal bans on hydraulic fracturing (the currently preferred technology to extract the natural gas from shale rock layers) in states like Vermont and also New York are witness to that. Overall however broad public support has been identified as one of the enablers of what has been labeled the shale gas revolution (Boersma and Johnson, 2013).

Contrary to the US, in Europe shale gas extraction is in an embryonic phase. To date, not a single molecule of shale gas has been produced. Similar to the US, in Europe opinions vary widely, from legal bans in France and Bulgaria to excitement in Poland. However, as the analysis shows, the Member State that most enthusiastically wants to start extracting shale gas from its soils, Poland, has substantial internal hurdles to overcome. If geologic conditions would turn out to be favorable, at the moment the lack of domestic market development, insufficient interconnection facilities and available infrastructure and also the meager implementation of existing European legislation would hinder large-scale exploitation of this natural resource (Johnson and Boersma, 2013).

Similar to the case study in chapter 4, this case study too outlines the dynamics (and complications) of European integration. Comparable to the US, in Europe resource extraction is the exquisite domain of the Member States. Unlike the US however, in Europe regulation of environmental concerns, for instance air quality, water quality, and noise pollution, are dealt with at the supranational level. Hence, while European institutions have repeatedly declared to be ‘neutral’ with regard to shale gas extraction (European Commission, 2012), Member States such as Poland have been awaiting assessments from Brussels regarding the existing frameworks to safeguard environmental concerns. Up to date it remains unclear whether the existing frameworks are deemed sufficient to address the environmental concerns, in case of large scale extraction of shale gas. It is difficult to assess why European Member States have accepted supranational interference with environmental concerns, while at the same time resource extraction is an exclusive domain of the Member States. It may be that advocates of environmental protection have acknowledged that their voices are best represented at the supranational level, since many of these concerns, e.g. air pollution or water related issues, do not have clear boundaries and may therefore be addressed more effectively in a broader policy initiative. Advocates of energy industries to the contrary seem to have a strong foothold in their respective Member States, and so do infrastructural companies and regulatory authorities. However, this study has suggested that the Member State level may not always be the most efficient level to deal with energy policy related issues. Despite this functional logic, transfer of power from the Member State level proves to be a lengthy process. There can be multiple reasons for this, such as unwillingness of national interest groups to give up power, or the national focus of most lobby groups in the Member States. More research is needed to ascertain the exact nature of these dynamics and their consequences.

Given the novelty of shale (and more broadly unconventional) gas extraction in the world, many issues remain unexplored. These issues comprise, for instance, the long-term consequences for markets in the US and elsewhere in the world, uncertainties regarding environmental risks and the effective regulation thereof, technological progress and innovation, and also the geopolitical consequences of this major shift in the energy landscape.

The study of Europe's market structure (chapter 6) examines several components of Europe's gas system. The analysis first shows that substantial investments in gas infrastructure are required throughout the continent, worth an estimated € 70 billion in the period up to 2020. Contrary to the US, in Europe it appears that there is no institute to orchestrate that the necessary investments, in particular in interconnection facilities and reverse flow capacity, are being made. This would not be problematic, if Member States would more efficiently coordinate these investments, yet this is currently not always the case. As a result, Europe's gas system is developing at different paces, with Northwestern Europe being reasonably well integrated, yet the rest of Europe falling behind (Abada and Massol, 2011; Renou-Maissant, 2012; Asche et al., 2013). Several studies have linked this asynchronous development to a lack of coordination / integration in the EU energy system (Spanjer, 2009; Correljé et al., 2009; Vazquez et al., 2012). The analysis also suggested that the expected decision regarding critical infrastructure (proving European institutions for the first time with a structural budget for energy infrastructure) may not be expected to substantially alter the status quo. This is because the proposed budget for the Connecting Europe Facility is € 9.1 billion euros for energy infrastructure (both natural gas and electricity) for the period up to 2020 and therefore only comprises a fraction of the financial means that are needed. Moreover, its allocation will be political, and therefore an easy subject to criticism.

Second, the study provides an overview of pending infringement proceedings, as of late 2012. The overview shows that currently fourteen Member States have not implemented existing legislation, which should have been implemented in the spring of 2011. It is also worth mentioning that this may not be the conclusive list of noncompliant EU Member States.

Academic literature suggests that cases are frequently solved soon after the EC starts an infringement procedure, but it unclear whether that is also the case when more than half of the Member States is noncompliant. More analysis would be useful here.

Third, chapter 6 analyzes the development of gas market trade in the EU. Again substantial differences within the EU have been identified. In Northwestern Europe market trade seems reasonably well developed (Harmsen and Jepma, 2011; Heather, 2012), yet in other parts of Europe oil-indexed long-term contracts prevail (Abada and Massol, 2011). The analysis of price developments at four important global benchmarks (i.a. British NBP and the German border) seems to confirm that the reported oversupply of natural gas in 2008 (Stern, 2009) made the difference between spot-market prices and long-term contracts so large, that renegotiations of existing contracts have taken place. Several studies note the advantages of long-term contracts for investments and stability, at a hidden cost for society (De Hautecloque and Glachant, 2009). The EC has expressed its support for hub-based trading (European Commission, 2012), yet seems to have the intention to let spot-market prices and long-term contracts co-exist. Hence it is difficult to assess what the future of long-term contracts in Europe is. Perchance these contracts are in the future increasingly indexed on spot-market natural gas prices.

The final part of chapter 6 analyzes the role of LNG in Europe's gas system. The study shows that substantial investments in LNG regasification terminals have been made throughout Europe. As a result in June 2012 Europe had 20 operational LNG terminals, with four being under construction, compared to twelve operational terminals in 2006. However, scholars do not agree on the future role of LNG in Europe, with some expecting an increase in LNG's share in Europe's energy mix (Dorigoni et al., 2010; Kumar et al., 2011), while others predict a decline (Lochner and Bothe, 2009). An analysis of industry data suggests that the center of gravity for LNG demand has been shifting further to Asia (due to increased LNG demand in Japan after Fukushima, and also upcoming LNG-markets such as China and India), while Europe's share fell from 27% in 2011 to 20% in 2012 (GIIGNL, 2012). More research would be useful here, since the future of LNG in Europe depends on a complex set of factors, e.g. future pricing mechanisms, carbon policies, and the size of streams of natural gas that may come online in for instance Australia and the US. Finally, an overview of infrastructural bottlenecks in Central and Eastern Europe suggests that it is currently uncertain whether particularly this region could benefit from more LNG supplies in Europe, since natural gas cannot always flow to and through that part of Europe.

This third case study also shows evidence of the complex process of European integration, as it touches upon the oft-postponed decision about the European proposal for a regulation on energy infrastructure. Despite the fact that this legislation was first proposed in the fall of 2011, as of writing in early 2013 it has not been adopted, even though the European Council explicitly requested this legislation from the EC. However, since its first publication, there have been questions from Member States representatives about the role of European institutions with regard to the financing of energy infrastructure. Since in particular Northwestern Europe has reasonably well developed gas infrastructure facilities, stakeholders from these Member States often oppose European interference with energy infrastructure financing. Other parts of Europe may benefit from European funds to develop their domestic gas market, and are therefore in favor. As outlined in the illustration of the European Energy Program for Recovery in chapter 3, in the rare case that European institutions have a mandate regarding investments in energy infrastructure, all Member States want a piece of the pie. Yet with the asynchronous development of parts of the European gas system, this mechanism does not necessarily contribute to further integration of the EU energy system as a whole. Ideally the money would be spent where it is most urgently needed, but in reality allocation may well turn into a heavily politically inspired, and therefore contentious, process.

The overview of energy security literature demonstrates that scholars overwhelmingly focus on the availability of supplies and the reliability of supply routes to Europe. The debate also shows that other vital components of the energy system, notably available infrastructure (interconnection, reserve flow) and regulations are not as embedded in the energy security discourse. This leads to several questions about Europe's attempts to address energy security. First, despite the academic focus on available supplies and the substantial amount of political talk about this topic, Europe lacks a coordinated approach. Instead, its relations with some of its key external suppliers are troublesome. It raises the question how valuable the concept of security and its debate are to deal with energy related issues. Or does the security debate mainly function as a welcome distraction of other issues that may be hard to solve? Second, while other vital components of the energy system have not been embedded in the security discourse, this study has given numerous examples how difficult European integration is proceeding in these issue areas as well. To give an example, despite the urgent need to invest billions of euros in additional infrastructural projects, European member states continue to struggle with questions about who has the mandate to carry out such operations and also who is going to pay for them. In sum, European energy security concerns have both an internal and an external dimension. This study has focused on the internal dimension and demonstrates that the EU is currently not agile to improve the internal inefficiencies that hinder natural gas to flow throughout the continent. The literature suggests that with regard to the external dimension of the discussion on security of supply, the EU equally struggles with its policy targets, as for instance indicated by the ongoing debates about the Third Energy Package or the role of long-term contracts, which may adversely affect the EU-Russian relationship.

European Union Energy Policy

The analysis in chapter 3 contains the most prominent European legislative documents related to the gas system that have been drafted in Brussels to date. Perchance in the spirit of the 1990s, policy makers' efforts have initially focused on market liberalization and development. Subsequently the attention shifted to other crucial parts of the gas system, i.e. infrastructure and regulation. The analysis shows that decision-making powers regarding infrastructure and regulation predominantly reside at the member state level.

Chapter 3 suggests that in policy making a certain asynchrony can be identified, which seems almost characteristic for the development of the European gas system. Some authors have referred to the Lisbon Treaty in excitement about the shared competence of energy policy between Member States and European institutions as adopted in 2010 (Trombetta, 2012). Yet it remains to be seen what that means in reality, since that same Lisbon Treaty makes clear: interference with national sovereignty would automatically block initiatives of supranational nature.

This analysis put forth several suggestions how completion of the internal gas system could be accelerated. First, implementation structures for existing legislation are not always functioning. Although this may be expected from for example Member States in Eastern Europe that only joined the EU in 2004, as of late 2012 the EC reported fourteen pending infringement procedures throughout the continent. Therefore an existing or new authority to orchestrate implementation, with punitive powers, could be helpful. Furthermore completing the internal energy system would require that regulations across the EU are better streamlined, for the current patchwork is non-transparent and not efficient. Also new incentives are needed to generate an appetite for investment in gas infrastructure facilities, albeit transmission lines, storage facilities or enhancement of increased interconnection and reverse flow technology. An institution to orchestrate these issues could very well be ACER, though its mandate would need expansion. Alternatively better coordination between Member States could be strived for, though the institutional history that was touched upon in this analysis does not suggest that would be an effective route. More research is needed into how to attract more financial means to invest in infrastructure and invest the necessary billions of euros in the decade ahead. It may be that increasingly public means are needed to develop parts of the EU system, in particular in Eastern and Southeastern Europe, for these markets may currently not be mature enough to attract sufficient private capital. The previous section discussed that the US gas system may also contain valuable lessons in this respect.

Though this thesis has analyzed the internal EU gas system, a study of EU energy security inevitably also touches upon external suppliers. This is because Europe has always been highly dependent on external suppliers for its natural gas. In that sense, the continuous difficult political relationship between the EU and Russia does not match one of the basic functionalist principles: form follows function. A necessary related question is: function for whom? Even with clear interests of stable relations on both sides of the equation, in terms of security of supplies and security of demand, EU / Russian relations remain burdensome, and some studies suggested that the two are further drifting apart (Boussena and Locatelli, 2013). This is remarkable, given the obvious interdependence between the two. As described, domestic production of natural gas in Europe, including potential natural gas from shale rock layers, is not expected to make up for even half of its consumption (Pearson et al., 2012). Despite the increase of natural gas that is produced globally and the increasing globalization of gas markets, it may be expected that prices dictate that the cheapest gas finds its way to Europe. Generally, that would be conventional natural gas transported through pipelines from its closest suppliers (Lochner and Bothe, 2009; Paltsev et al., 2011). Considering some reports that production in Norway is in decline (Söderbergh et al., 2009) and also potential political turmoil in Algeria, large amounts of Russian gas in Europe’s future energy mix seem inevitable. Substantial challenges thus have to be overcome to improve European / Russian relations. Continued quarrels over the Europe's Third Package, ongoing struggles of Gazprom to adjust itself to the new market realities of lower gas tariffs, more spot market trade, and renegotiation of long-term contracts, and worries about the lack of investments in so-called 'green fields' in Russia are witness to that.

Given this explicit external dimension of future European energy security however, further strengthened by large transit pipelines, investing in stable relations seems potentially beneficial to both parties. The withdrawal of Russia from the Energy Charter Treaty in 2009 and the legal quarrels over the Third Package in 2012 mark exactly the opposite direction. The external dimension of European energy security confirms that the EU is in fact a suboptimal level to govern the European gas market. From a functional perspective, large and nearby suppliers of natural gas, i.e. Russia, Norway and Algeria, should be an integral part of the relevant governance structures. Since within Europe there is no coherent external energy policy, as a consequence relations between these suppliers and Europe have evolved in different ways. This seems to have led to little debate when Norway and also Algeria are concerned. In the case of Russia, to the contrary, since 2006 the political debate about the reliability of the country as Europe's largest natural gas supplier has bloomed. Arguably the occasional supply disruptions have caused uncomfortable situations for some Europeans citizens. Yet negative sentiments surrounding Russia have also functioned as a distraction from problems related to the EU internal gas market. As this study has shown, the proclaimed security threats often have to be taken with a grain of salt. Also, the review of academic literature on energy security suggests that a substantial amount of contributions have faced this pitfall by focusing exclusively on the external dimension of energy security, whereas some of its acute challenges are *within* the European gas market.

All this would fit into an idea for the future EU gas system, to be developed on short notice and considering the unique features that the European system has. The results of this study have suggested that it may indeed be difficult to 'shoehorn' this system into a particular desired market model, so choosing its own path seems to be the only way forward for Europe. More empirical work is required to establish what exactly that own path would comprise, but it seems reasonable to assume that substantial import dependency with regard to natural gas is one key element that would have to be taken into consideration.

Reflection

Several aspects of this dissertation deserve a short reflection. First and foremost the concept of energy security is subject to continuous debate. The discussion sometimes almost takes religious forms, in which facts are not always adequately presented. To give an example, despite repetitive talk about energy resources being securitized, there is hardly any evidence available to support this notion. Rather, the topic is politicized. Though some commentators have hinted at the differences between some of the EU Member States (where Eastern European states are generally reported to have a higher degree of securitization of energy resources than states in Northwestern Europe) here too it is worth noting a certain degree of rhetoric. Up to date it is unclear why, in for instance the case of Poland, when Russia would be an existential threat, as portrayed by some Polish policy makers and some academic scholars, up to date no significant investments have been made to prepare Poland to receive natural gas from different suppliers. It could have invested in a pipeline with Denmark to receive Norwegian gas, or in interconnection and reverse flow facilities with Germany to improve its options to receive natural gas from Northwestern Europe. The fact that is has chosen not to invest in alternatives demonstrates the level of rhetoric in energy security debates in Europe. It also demonstrates that though the tone of these debates may sometimes suggest a high level of securitization, in fact political actions or willingness to act tell a different story. More research is needed to unravel the reasons behind this difference between the expressed concerns and factual behavior.

Another problematic feature of the concept of energy security is the myriad of different interpretations. As this study has shown, in general most attention is paid to available supplies and reliability of suppliers, and less is written about other crucial features of the gas system, i.e. infrastructure and regulatory authorities. Some authors have called for a common standard of energy security, but this seems impossible given the political dimension to energy resources, differences in interests per actor as well as changes over time. The good news however is that over time the enormous interest of scholars in energy security evaporates, only to return after a supply disruption or comparable crisis. More research is needed to address the question why so many scholars discuss energy resources in terms of a security matter. This analysis suggests that this framing is not necessarily helpful in addressing energy resource related questions.

The theoretical framework requires several reflections. Europe's dealing with energy security corresponds only to a limited extent with insights from (neo)functionalist theory. Though the establishment of the internal market may seem in line with functionalist thinking, in practice this is questionable. This study has shown that borders are still relevant, also within the EU, which for instance becomes apparent through the lack of physical interconnection capacity. It seems that even when it is specified for whom something can be functional and to what purpose (e.g. further market integration to create alternatives in case of external supply disruptions) market integration may be hindered. Thus, when addressing the basic notion whether form follows function, the results of this study suggest that this is currently not always the case: the EU can be explicitly about form and the question who is in and who is out, and the difficult relations with Russia are an example of this. The relations with another major external supplier however, Norway, suggest a different narrative. Here 'function' does seem to prevail, and form (being part of the EU or not) seems to be less relevant. Thus, while beyond the scope of this study, more comparative research into the dynamics of relations between the EU and its three major suppliers of natural gas, Russia, Norway, and Algeria, would be useful and possibly provide an interesting exploration of (the limits to) neofunctionalist thinking. Insights from new institutional economics have been helpful in this study, for the research focused predominantly on the EU internal gas market. Therefore this study partly sought to address institutions and context, elements that are crucial to economic activity and that these theoretical contributions focus on. They also contain an imminent component, for changing the formal rules of the game (legislation, regulations) is expected to take decades (e.g. Williamson, 2000). It is however unclear whether this is always the case. And if so, what would that mean in terms of European energy market development and related security questions? It is worth reiterating that this stream of research is comparatively new and that many issues related to institutions yet require to be discovered. Finally multilevel governance as a framework of analysis has been valuable since it acknowledges the role of actors other than states in governance structures. The distinction between public and private actors was also relevant and helpful in this study. Finally the framework proved applicable to the case of the US, which was used as a benchmark. What this study did not do, is test MLG as a theory of European integration. However, that debate was beyond the scope of this research project.

The case studies in this dissertation deserve several remarks. First, the case study on investments in gas infrastructure focused exclusively on US interstate gas pipelines. Therefore more work is needed on for instance intrastate pipelines, for this may bring about additional and perchance different results. Moreover one could argue that intrastate pipelines in the US in geographical sense show remarkable resemblance with most European gas pipelines, if only since these have predominantly been organized at the Member State level. Although existing academic contributions do not suggest that this is in fact a flaw in this research design, more empirical work would be useful here. In that same study more work could be done to examine the investment rationale in other EU Member States than the two under study here. Although academic studies confirm that Great Britain and also the Netherlands can be seen as frontrunners in the EU with regard to energy regulation issues, more in-depth work on practices in other Member States may bring about valuable lessons on for instance incentives to increase an appetite for investments in gas infrastructure. One caveat that applies to the entire case study on shale gas extraction is that this field is new and unexplored. Though therefore offering opportunities to carry out new research, it also brings along many unknowns and uncertainties. To give an example, despite the literally thousands of wells that have been drilled so far in the Marcellus shale, the largest and most promising shale rock layer in the US, up to now it is highly uncertain how much natural gas can eventually be economically recovered from it. That has to do with the size of the rock layer, covering large parts of Ohio, Pennsylvania, West Virginia and New York, but also with the fact that in one of those states (NY) hydraulic fracturing has not been permitted. Therefore, and because of possible future technological developments, relatively little can be said about recoverable reserves in the Marcellus shale. This also contributed to the enormous downscale in earlier estimates, as reported by the US Energy Information Administration. Logically, in comparison to the US there are no data available in the EU about recoverable reserves of natural gas from shale rock layers, making future predictions about its role on this continent highly uncertain. As over time more data are expected to emerge, many questions remain regarding the consequences of shale gas for markets, its currently fiercely disputed environmental consequences, effects on other natural resources such as water, and also its geopolitical consequences. As for the last case study on market structure, it reiterates how much work remains to be done to construct the EU energy system, while it also laid out some of the political challenges that inevitably follow from the geographical location of the continent. Tucked in between large external suppliers of natural gas, it leaves a tremendous responsibility for academics, policy makers and business representatives alike to shape Europe’s energy system and construct external relations in a fashion that facilitates secure and affordable supplies on the way to a post-carbon era.

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